# ARABIS IN EASTERN AND CENTRAL NORTH AMERICA

Milton Hopkins

(*Continued from page 98*)

5. A. GLABRA (L.) Bernhardi. Biennial from a usually stout taproot; stem erect, tall, stout, usually simple below, rarely branching at base, 6–12 dm. high, hirsute at base with simple or bifurcate spreading to subappressed hairs, passing to glabrous and glaucous above or very rarely glabrous throughout: basal leaves spatulate to oblanceolate, rarely lyrate-pinnatifid, entire or irregularly dentate, petioled, acutish, 5–12 cm. long, 1–3 cm. broad, those of the first year rather finely stellate-pubescent on both surfaces with forked trichomes, those of the second year less so or often merely hirsute along the midrib of each surface or more rarely glabrous throughout; petioles hirsute with simple or forked hairs; cauline leaves lanceolate to elliptic-oblong, sessile with an amplexicaul sagittate or auriculate base, imbricate, passing upwards to subimbricate or more rarely subremote, entire or the lowermost sometimes slightly denticulate, acutish, very variable in size, 2–12 cm. long, 1–3.5 cm. broad, glabrous on both surfaces or rarely the lowermost slightly hirsute or stellate-pubescent along the midrib: flowers small, in close or loose racemes; flowering pedicels glabrous, 0.5–1 cm. long at anthesis, slender, erect or ascending, appressed to subappressed; sepals membranaceous, 2–5 mm. long, glabrous, obtuse to subacuminate, oblong, greenish or frequently purple, ¾ the length of petals; petals (fresh) cream-color to yellowish, 2.5–6 mm. long, narrowly oblanceolate to linear: siliques 5 (4–)–9.5 cm. long, 0.75–1 mm. broad, roundish, narrow, straight or slightly curved, appressed close to stem, distinctly erect and ascending, one-nerved at least beyond the middle and usually to the tip or very nearly so; fruiting pedicels erect and appressed to subappressed, glabrous, 7–18 mm. long at maturity; style short and stocky, 0.35–0.85 (–1) mm. long, 0.25 mm. broad; stigma cupulate; mature and fertile seeds irregular in outline, most often elliptical to oblong, sparingly winged all around or at least partially so or very rarely entirely unwinged, in either one or two rows, averaging 1 mm. long, 0.5 mm. broad.—A circumboreal, semicosmopolitan species with two pronounced varieties in North America.

*a.* Pubescence of stem of simple or more rarely bifurcate, spreading hairs ..... var. *typica.*
*a.* Pubescence at base of stem stellate, of trifurcate, appressed to subappressed hairs ..... var. *furcatipilis.*

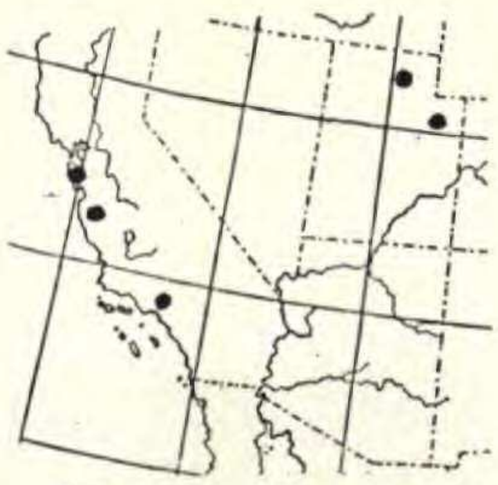
Var. **typica.** *A. glabra* (L.) Bernh. Syst. Verz. Erf. 195 (1800); Britton & Brown, Ill. Fl. ii. 150 (1897); Britton, Man. Fl. 465 (1901); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Nelson & Coulter, New Man. Rocky Mt. Bot. 226 (1909); Frye & Rigg, Nw. Fl. 189 (1912); Piper & Beattie, Fl. Nw. Coast 170 (1915); Jepson,

Man. Fl. Pl. Calif. 428 (1925). *Turritis glabra* L. Sp. Pl. ii. 666 (1753); Smith & Sowerby, Eng. Bot. xi. t. 777 (1800); Smith, Fl. Brit. ii. 715 (1802); Persoon, Synop. ii. 205 (1807); DC. Syst. ii. 211 (1821); DC. Prod. i. 142 (1824); Hooker, Fl. Bor.-Am. i. 40 (1829); T. & G., Fl. N. Am. i. 78 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 463 (1840); Walpers, Rep. i. 129 (1842); Ledebour, Fl. Ross. i. 116 (1842); Dietrich, Synop. iii. 688 (1843); Wood, Classbk. ed. 2: 166 (1847); Gray, Man. 36 (1848). *Dentaria foliis simplicibus* Scopoli, Fl. Carn. 516 (1760); Wagner, Deutsche Fl. ii. 50 (1882). *Erysimum glastifolium*, Crantz, Class. Crucif. 117 (1769). *Turritis perfoliata* Necker, Delic. i. 283 (1773); Bolander, Cat. Pl. San Francisco, 5 (1870). *A. perfoliata* Lam. Dict. i. 219 (1793); Gray, Man. ed. 5: 69 (1867); Watson in Bot. King's Rep. v. 17 (1871); Porter in Hayden, Rep. 478 (1871); Brewer & Watson in Geol. Surv. Calif. i. 31 (1880); Günthart in Biol. Bot. Heft 77 (1912). *Arabis Turritis* Clairville, Man. d'Herb. 223 (1811), non *Arabis Turrita* L., Sp. Pl. ii. 665 (1753). *Sisymbrium simplicissimum* La Peyrouse, L'Hist. Abreg. 382 (1813); and Suppl. 92 (1818); Poir. Suppl. v. 161 (1817). *Turritis macrocarpa* Nutt. ex. T. & G. Fl. N. Am. i. 78 (1838); Eaton & Wright, N. Am. Bot. ed. 8: 463 (1840); Walpers, Rep. i. 129 (1842); Dietrich, Synop. iii. 689 (1843); Torrey, Bot. Wilkes Exped. 227 (1874). *A. macrocarpa* Torrey in Bot. Mex. Boundary, pt. 1: 32 (1858).—Sandy fields, dry roadsides, river banks, basic ledges or cliffs, thickets and woods, southern Quebec, south to Pennsylvania and North Carolina, west to Arizona, California and British Columbia. The following are characteristic. QUEBEC: Grosse Isle, Montmagny Co., sur rochers en compagnie de *Juniperus horizontalis*, *Victorin*, *Rolland*, *Rousseau & Meilleur*, no. 40,032; shores of Lake Temiscouata, *Victorin*, no. 95; Ironside, Vallée de la Gatineau, *Victorin*, no. 15,622; rocks beside road to Peasly Pond, Lake Memphremagog, *Churchill*, 15 Aug. 1903. MAINE: waste places, New Limerick, *O. W. Knight*, no. 1; dry limestone ledge, Norridgewock, *Parlin*, no. 3,070; beside railroad track, Crystal, *Pease*, no. 2,831; recent clearings and railroad embankments, Houlton, *Fernald & Long*, no. 13,706; newly seeded field, North Berwick, *Parlin*, no. 1,455. NEW HAMPSHIRE: open woods, Surrey, *Fernald*, no. 172; roadside ledge, Stewartstown, *Pease & Fernald*, no. 16,570; roadside east of Notch, Dixville, *Pease*, no. 16,313. VERMONT: Rutland, *Eggleston*, nos. 1,031 & 1,033; Waterbury, *Greenman*, no. 593 (as *A. hirsuta*); roadside, Howe's Crossing, Newfane, *L. A. Wheeler*, 12 July 1917. MASSACHUSETTS: steep rocky wooded slope, North Adams, *Fernald & Long*, no. 9,563; cliffs in woods, Concord, *Fernald*, no. 9,562; woods, Erving, *Hunnewell, MacBride & Torrey*, 16 May 1915. CONNECTICUT: field, Farmington, *Weatherby*, no. 729; dry scrubby field, Bridgeport, *E. H. Eames*, no. 8,191; sandy plain, Southbury, *Harger*, no. 6,030. NEW YORK: thickets, Glenmont, *House*, no. 17,340; roadside, Potsdam, *O. P. Phelps*, no. 527; open glades of woods in valley, Elmira, *T. F. Lucy*,

no. 403 [NY]. New Jersey: Hamburg, Morris Co., *W. H. Rudkin & N. L. Britton*, June 1, 1884 [NY]; zinc mines, dry hill, Franklin Furnace, *Wm. M. Van Sickle*, 19 May 1891 [Bklyn]. Pennsylvania: old field, introduced with alfalfa seed and persisting for some time, Sellersville, Bucks Co., *W. M. Benner*, June 18, 1912; Troy, Bradford Co., *E. B. Bartram*, July 19–20, 1913 [NY]; Tannersville, *A. A. Tyler*, 12 June 1896 [NY]. Delaware: field near Concord Station, Wilmington, *A. Commons*, 31 June 1896 [Phil]. West Virginia: Davenport, Tyler Co., *E. E. Berkeley*, no. 784 [Mo]. North Carolina: moist banks, Biltmore, *Biltmore Herb.*, no. 120 (as *A. perfoliata*) [NY]. Ontario: low ground, Camp Alexander, Nipigon River, *Macoun*, no. 1,748 [Can]; dry limestone barrens east of Tobermory, Bruce Co., *Stebbins, Jeffrey & Loveless*, no. 142; sandy roadside, Webbwood, *Fernald & Pease*, no. 3,349. Michigan: roadside thicket Bête Grise, Keweenaw Co., *Fernald & Pease*, no. 3,350; sandy soil, aspen association, Douglas Lake, *Ehlers*, no. 410; near Lansing, *L. H. Bailey*, 22 June 1887. Ohio: rocky open soil, Newell Ledge, Portage Co., *R. J. Webb*, 13 June 1908; near Painesville, *Herb. W. C. Connor*, no. 145 (as *A. confinis*); Russell, *G. B. Ashcroft*, June 1897. Indiana: in a fallow field 5½ mi. ne. of Knox, *Deam*, no. 30,889 (as *A. brachycarpa*); in low peaty soil in woods, road leading to Spring Lake, *Deam*, no. 23,743. Wisconsin: just inside the beach line, north shore of Willow Point, Delavan Lake, Delavan, *S. C. Wadmond*, no. X188; Eagle River road, Vilas Co., *S. C. Wadmond*, no. 411–2; Lake Emily, *J. H. Schuette*, 5 June 1898. Illinois: Chicago, *E. Hall*, 1863; damp open woods, near Wady Petra, *V. H. Chase*, 25 May 1895 (as *A. brachycarpa*); Elgin, *Geo. Vasey*, without number [Amh.]. Manitoba: St. Lazare, near Fort Ellice, *Macoun & Herriot*, no. 69,856; Lake Winnipeg Valley, *Bourgeau*, 1857 (as "*A. hirsuta*"—in part). Minnesota: along road, sandy soil near Touriot Camp, Clearwater Co., *J. B. Moyle*, no. 51; Good Harbor, Lake Superior, *Henry Gillman*, 16 Aug. 1868; in virgin prairie soil, 5 mi. ne. of Panoford, *Rosendahl*, no. 4,847 (as *A. Drummondi*) [Minn.]. Missouri: Jefferson Barracks, *A. S. Hitchcock*, 6 May 1890 [Mo.]. Arkansas: Little Rock, *H. E. Hasse*, April 1885 [NY]. North Dakota: Devils Lake, Ramsey Co., *Lunell*, 1 July 1905 (as *A. brachycarpa*) [NY]; in thickets, Devils Lake, *Lunell*, 29 June 1902, no. 524 (in part) [Minn]. South Dakota: rim of Spearfish Canyon, limestone, near Savoy, elev. 5,700 ft., *Murdoch*, no. 4,127 (as *Thelypodium elegans* ?); Custer, Black Hills, *Rydberg*, no. 517. Nebraska: Hershey, *C. D. Mell*, no. 85 [US]; on Middle Loup River near Norway, Thomas Co., *Rydberg*, no. 1,405 (as *A. hirsuta*) [US]; near Plummer Ford, Dismal River, Thomas Co., *Rydberg*, no. 1,508 [US]. Saskatchewan: low ground, Cypress Hills, *J. M. Macoun*, no. 1,757 [Can]; on McHay's Farm, rare, 12 miles from Prince Albert, *Macoun*, no. 12,368 [Can]. Alberta: west of Edmonton, *Spreadborough*, no. 19,248 [Can]; Rocky Mts., near Banff, *ex Herb. W. M. Canby*. Montana: Bridger Mts., alt. 7,000 ft., *Rydberg &*

*Bessey*, no. 4,208; gravelly railroad embankment near second bridge above Bonner, Blackfoot Valley, 3,600 ft., *C. L. Hitchcock*, no. 1,666. IDAHO: meadow near edge of grain field, 5,700 ft., Corral, Blaine Co., *Macbride & Payson*, no. 2,927; sandy soil, island in Clearwater River, above Lewiston, *Sandberg, MacDougal & Heller*, no. 88. WYOMING: burnt alder patch, French Creek, Carbon Co., *Goodding*, no. 2,025; roadside, Undine Falls, *Nelson & Nelson*, no. 5,682. COLORADO: dry bank of creek, Tabegnache Basin, alt. 8,000 ft., *Payson*, no. 572; bank of Elk River, *C. S. Crandall*, no. 5; common, Mancos, *Baker, Earle & Tracy*, nos. 112 & 310. UTAH: meadow 8,000 ft., Granite Canyon, *MacGuire & Becraft*, no. 2,625; Wahsatch Mts., elev., 6,500, June 1869, *Sereno Watson*, no. 68 (as *A. hirsuta*) (This is not the same plant as Watson's no. 68 in the Herbarium of the N. Y. Bot. Gard., which is good *A. pycnocarpa*. The two plants were collected at different times and in different places in Utah and are obviously quite different species.). NEVADA: Kings Canon, Ormsby Co., *Baker*, no. 1,117; Washoe Lake, *M. E. Jones*, 7 June 1897 [US]. NEW MEXICO: Winter Folly, Sacramento Mts., *E. O. Wooton*, 13 Aug. 1899; along Willow Creek, vicinity of Chama, Rio Arriba Co., *Standley*, no. 6,718 (as *A. ovata*) [US]. ARIZONA: Prescott, *H. H. Rusby*, 21 May 1883 [NY]; Sierra Ancha, s. Arizona, *G. J. Harrison*, no. 7,849 (as *A. hirsuta*) [US]. CALIFORNIA: Plum Valley, Warner Mts., *J. T. Howell*, no. 12,021; Middle Peak, Cuyamaca Mts., San Diego Co., *Abrams*, no. 3,867; in meadow, Fish Creek, San Bernadino Mts., *Munz & Johnston*, no. 8,533; frequent in grassy woodlands, Mather, 4,600 ft., *D. H. Keck*, no. 1,148. OREGON: steep seaward slope, The Heads, Port Oxford. *M. E. Peck*, no. 8,463; along Dixie Creek near Prairie City, Grant Co., *Henderson*, no. 5,288. WASHINGTON: Browns Island, San Juan Islands, *S. M. & E. B. Zeller*, no. 762; near Sprague, Lincoln Co., *Sandberg & Leiberg*, no. 143. BRITISH COLUMBIA: Campbell River, Vancouver Island, *J. T. Howell*, no. 7,599; vicinity of Ucleulet, Vancouver Island, *Macoun*, no. 78,280 [Can]; road at base of bluff, north bank of Peace River at Taylor Flat, *Raup & Abbe*, no. 3,561. ALASKA: Wells, *J. P. Anderson*, no. 2,091 (as *Turritis glabra*) [NY]; Haines, *J. P. Anderson*, no. 784 (as *A. Drummondi*) [NY]. *Fl.* May–June; *Fr.* June–July.

Var. **furcatipilis**, n. var., caulis pubescens pilis stellaribus et adpressis vel subadpressis.—Utah and California. The following are characteristic. UTAH: Logan City Camp, Logan Canyon, Cache Co., *MacGuire*, no. 3,437 (as *A. Drummondi*) (TYPE in Gray Herb.); Parley's Canon, Wahsatch Mts., *S. G. Stokes*, 8 June 1901 [US]. CALIFORNIA: roadside, Linda Vista near Pasadena, *J. Grinnell*, 11 April 1906 [US]; no locality, *Thomas Bridges*, no. 15; Santa Lucia Mts., Monterey Co., *R. A. Plaskett*, no. 53; San Francisco, *J. M. Bigelow*, 3 April 1853–4 [NY]. MAP 8.



MAP 8. Range of ARABIS GLABRA, var. FURCATIPILIS.

*Arabis glabra* is a semicosmopolitan plant of circumboreal range, often possessing a weedy tendency, extending throughout temperate Asia, Europe and North America. For a species of such wide distribution, one would anticipate the occurrence of numerous varieties. But in North America only one such variation seems worthy of note. Var. *furcatipilis* is in every way like the typical form of the plant except for the pubescence of the stem which in the latter is rather coarse and definitely spreading, but which in the former is decidedly fine, stellate and appressed. The range of this variety seems limited to local stations in extreme western North America; I have seen no European or Asiatic material of it.

*A. glabra* is found in a variety of habitats. In North America it grows most frequently along roadsides, railroad embankments, in fields or meadows, and in open thickets, habitats which suggest its introduction from Europe. One also finds it, less commonly, on shady limestone cliffs and bluffs or on the walls of canyons, undisturbed locations where the plant is unquestionably native. With these facts of native habitat in mind, I endeavored to separate the European from the American material in the Gray Herbarium, but without success. The seeds of typical specimens from North America were minutely scrutinized as were those of representative European and Asiatic plants, but no fundamental differences were observed. The midnerve of the silique was studied in anticipation of yielding a character on which to differentiate the two, but again the results were negative. Finally, the auricle at the base of each cauline leaf was examined and at first it seemed that the question of identity was solved. But continued investigation proved that both in the Old World and in the New, the auricles were of two kinds, those forming an acute angle with the main stem and those forming an obtuse or a right angle with it and, consequently, it was concluded that the plants found in North America differed in no way from those found in Europe or temperate Asia.

The species exhibits many extremes in its various taxonomic characters. For example, the cauline leaves commonly vary from narrowly lanceolate to broadly elliptic-oblong, and their apices may range from acuminate to obtuse, while their auricles may be either sagittate or auriculate, forming an acute or a right angle with the stem. The flowers may be in a semi-loose raceme or in a compact one, the sepals may range from obtuse to subacuminate and the petals may not

infrequently be fairly broad, although their most typical form is rather narrow. The seeds show considerable discrepancy in their margins, some being partially winged, some winged all around, while some are wingless. And the shape of the seeds is often very irregular, due of course to their being crowded in the pods. Those which are elliptical or suborbicular at maturity usually are found in only one row in the silique, while those with an irregular or angular outline invariably come from pods the seeds of which are tightly packed in two rather incomplete rows. I have attempted to separate those plants with winged or partially winged seeds from those whose seeds lack wings, but entirely without favorable results. It is not uncommon for plants possessing winged seeds to be found in the immediate vicinity of those with partially winged ones, hence the futility of any geographic segregation based on this character is obvious. Other characters which vary considerably are the length of the style which may vary nearly a millimeter, and the size of the silique which has a wide range, from 5 (rarely 4) to 9.5 mm. long.

The extreme forms of the plant have not passed without recognition. In 1874, Torrey, writing on the plants of Pacific North America said of *Turritis macrocarpa* Nutt.: "not uncommon.—Too near *Turritis glabra*, which it represents on the Pacific Coast."[1] Nuttall's type-sheet of *T. macrocarpa* is in the Gray Herbarium, and differs in no way from typical *A. glabra* except in the length of the siliques which average 9–9.5 mm. and, although these are unquestionably longer than most of those of the typical plant, this specimen shows no other variations which necessitate lowering it to varietal rank under *A. glabra*, or which permit its maintenance as a separate species. Numerous herbarium specimens of *A. glabra* which are in any way unusual frequently bear a question mark on the label, showing that their identity was dubious at the time of determination, but these only serve to emphasize again, at least to the present writer, the fact that *A. glabra* is a variable species, but with few extremes of sufficient constancy for the segregation of varieties or forms.

The plates of *A. glabra* in various European floras and manuals further emphasize this point. In Flora Danica, O. F. Müller's plate[2] shows a plant with elliptic-lanceolate cauline leaves which taper to an acuminate apex, and which possess long, sagittate auricles making a right angle with the base of the stem. These features give the plant

[1] Torrey in Bot. Wilkes Exped. xvii. 227 (1874).
[2] O. F. Müller, Fl. Dan. v. t. dcccix (1782).

an aspect somewhat different from the usual form with which we are familiar—a plant with cauline leaves less sagittate and less acuminate. In Thomé's Flora von Deutschland,[1] however, one is immediately impressed by the similarity of the plate to our familiar North American plant. Here the leaves are lanceolate, subacute or obtuse, and the auricles are not especially enlarged but make an acute angle with the main stem. In Bonnier's Flore de France, Suisse et Belgique[2] one sees a plant very similar to that illustrated in Thomé's Flora but differing somewhat in the shape of the leaves. In both European and North American herbarium material I have seen plants showing these and other variations, but conclude that they are to be anticipated in a species possessing such a wide range and often having the tendency of a weed.

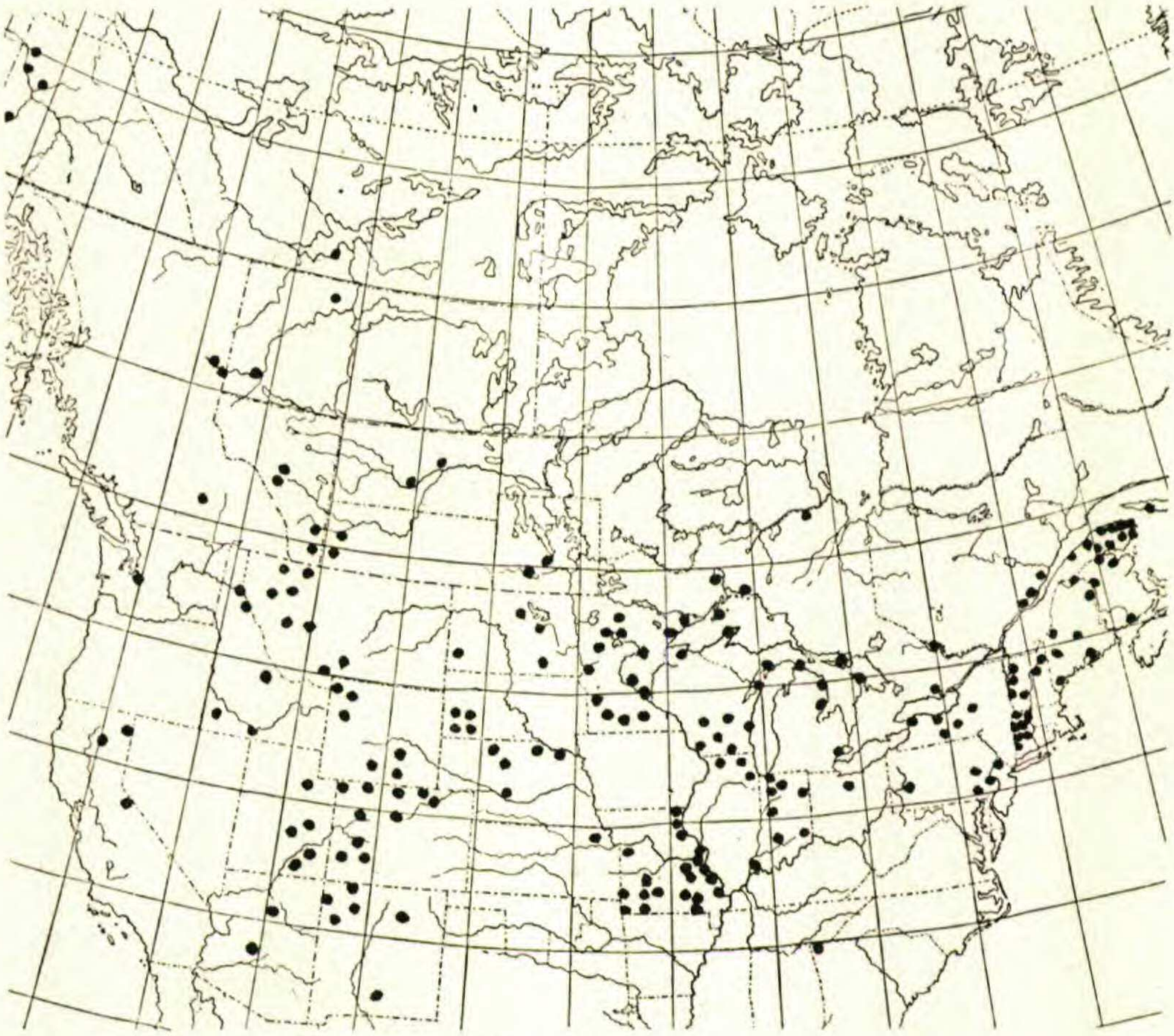
6. A. **pycnocarpa**, sp. nov. (Tab. 458, fig. 1–3), planta biennis: caulibus erectis, gracilibus, simplicibus, vel ramosis inferne et superne, 1.5–8 dm. altis, inferne dense vel sparse hirsutis superne hirsutulis vel glabris, pilis simplicibus et bifurcatis, subadpressis vel patentibus: foliis radicalibus oblongis vel oblanceolatis, 2–8 cm. longis, 0.5–1.5 cm. latis, subscabris, serrato-dentatis vel integris, obtusis vel rarius acutis, utrinque villoso-hirsutis vel hirsutulis pilis simplicibus et bifurcatis vel rariter trifurcatis, petiolis hirsutulis; foliis caulinis oblongis vel lineari-lanceolatis, scabriusculis, subdentatis vel integris, 1–4 cm. longis, 3–14 mm. latis, subremotis vel imbricatis, obtusis vel subacutis infimis subamplexicaulibus, utrinque hirsutis basi subauriculatis vel subsagittatis, summis sessilibus, utrinque hirtellis vel rarius glabris: floribus parvis, in racemis laxis; pedicellis floriferis glabris vel rarius hirtellis per anthesim, 4–9 mm. longis, gracilibus, valde erectis; sepalis 2.5–3.5 mm. longis, 0.75–1 mm. latis, membranaceis, oblongis, petala ⅔ aequantibus, glabris vel parce hirsutis; petalis albis vel pallide roseis, 4–5 (–6) mm. longis, 0.75–1 mm. latis, oblongo-lanceolatis; siliquis plerumque plurimis, plus minusve rectis, angustis, 3–5 cm. longis, 0.75–1 mm. latis, valde erectis et adpressis, glabris, valvis univenosis ad medium vel parce ultra; pedicellis fructiferis erectis, subadpressis, glabris, maturitata 7–9 mm. longis; stigmatibus parvis, cupulatis; stylis gracilibus, 0.4–0.9 mm. longis; seminibus uniseriatis, suborbicularibus vel oblongis, 1–1.25 (–1.35) mm. longis, 0.4–0.7 mm. latis, alatis, ala ambitu toto seminis aequilata vel superne latiore.—Basic ledges, cliffs, bluffs, dry and rocky or moist banks and gravelly alluvium, eastern Quebec to Yukon, south to Georgia, Indiana, Illinois, Missouri, Kansas, New Mexico, Arizona and California. Represented in North America by four varieties.

[1] Thomé, Fl. von Deutschland, ii. t. 272 (1886).
[2] Bonnier, Fl. France, Suisse et Belg. i. pl. 40 (1911).

*a.* Pubescence of stem spreading or subspreading, predominantly of simple hairs. . . . *b.*
  *b.* Mature siliques not less than 3 cm. long. . . . *c.*
    *c.* Mature siliques numerous; cauline leaves more than 10, imbricate to subimbricate, hirsute; stem hirsute throughout; sepals herbaceous. . . . . var. *typica.*
    *c.* Mature siliques few; cauline leaves 2–10 (–12), remote to subremote, the middle and uppermost glabrous; middle and upper part of stem glabrous; sepals membranaceous. . . . . var. *glabrata.*
  *b.* Mature siliques short for the species, 1.5–3 cm. long; plants of eastern Quebec only. . . . . var. *reducta.*
*a.* Pubescence of stem strictly appressed, often giving a strigose appearance, predominantly of bifurcate hairs. . . . . var. *adpressipilis.*

Var **typica.** QUEBEC: slaty ledges near Cap Chat River below Pineau River, Matane Co., *Fernald & Pease*, no. 25,114; sandy and gravelly bars, Grand Cascapedia River, Bonaventure Co., *Collins & Fernald*, no. 96; dry ledges, St. Jean l'Evangéliste, Nouvelle, Bonaventure Co., *Collins & Fernald*, July 19 & 20, 1904 (TYPE in Gray Herbarium); limestone conglomerate cliffs, headland north of Baptiste Michaud's, Bic, Rimouski Co., July 18, 1904, *Collins & Fernald.* ANTICOSTI: sur le talus argilo-calcaire près de l'embouchure, Rivière Vaureal, *Victorin & Rolland-Germain*, no. 27,186. NEW BRUNSWICK: talus of cliffs, gorge of the Aroostook, Victoria Co., Aug. 17, 1901, *Fernald;* dry ledges by the St. John, Connors, Madawaska, *Pease*, no. 2,516; amongst rocks, Campbellton, *Chalmers*, no. 1,696 [Can]. MAINE: gravelly bank, Fort Fairfield, *Fernald*, no. 12; gravelly esker, Alton, August 18, 1900, *Fernald.* NEW HAMPSHIRE: west side of Mt. Prospect, Lancaster, *Pease*, no. 16,928; shaded ledges, narrows of Connecticut River, Bath, Coos Co., *Pease*, no. 19,638. VERMONT: shore of Lake Champlain, Charlotte, June 3, 1881, *Horsford;* West Rutland, May 28, 1893, *W. W. Eggleston;* limestone pasture, East Dorset, June 1, 1908, *G. G. Kennedy.* MASSACHUSETTS: R. R. track, Montague, May 29, 1892, *Churchill;* moist rocky ledges, Sunderland, Aug. 7, 1887, *Deane;* ledges near Bardwell's Ferry, Shelburne, May 11, 1912, *Forbes & Schweinfurth.* CONNECTICUT: dry ground near the Hoosatonic River, Oxford, May 30, 1888, *Harger;* ledges at Bolton Notch, Bolton, Tolland Co., May 26, 1916, *A. W. Driggs.* NEW YORK: ledges of ravine, Enfield, Tompkins Co., *Eames & MacDaniels*, no. 584; Watertown, 1854, *G. W. Clinton;* limestone cliffs, Trenton Falls, Oneida Co., *Haberer*, no. 63. NEW JERSEY: Franklin, *A. P. Garber*, July 1871 [US]; woods along road from Newton to Springdale, Sussex Co., just ne. of Newton, *H. W. Pretz*, no. 525 [Phil]; Swartzwood Lake, Sussex Co., *J. J. Carter*, 5 July 1907 [Phil]. PENNSYLVANIA: on limestone rocks, Chestnut Ridge at Hillside, Westmoreland Co., *John Bright*, no. 143 [Deam]; limestone bluffs on Conestoga Creek, Lancaster, *Long*, 22 June 1909 [Phil]; Kent's Furnace, Easton, *T. Seal*, 28 May 1884 [Phil]. GEORGIA: valley of the Coosa [Floyd Co.], *Ravenel*, without date [Mo]; banks of the Coosa, Rome, *Ravenel*,

without date [Mo]. Ontario: ledges by R. R., Jack Fish, Thunder Bay Distr., *Pease & Bean*, no. 23,671; on limestone, Ottawa, *Rolland*, no. 71; Cove Island, Tobermory, Bruce Co., *Krotkov*, no. 7,460 (as *A. brachycarpa*). Michigan: Woodson's Ramport, Mackinac Island, July 11, 1915, *W. H. Manning;* Thunder Bay Island, Alpena Co., 18 July, 1895, *C. F. Wheeler;* Isle Royale, *W. S. Cooper*, no. 38. Ohio: *Sullivant*, without date and without number; *Riddell*, 1834 [NY].



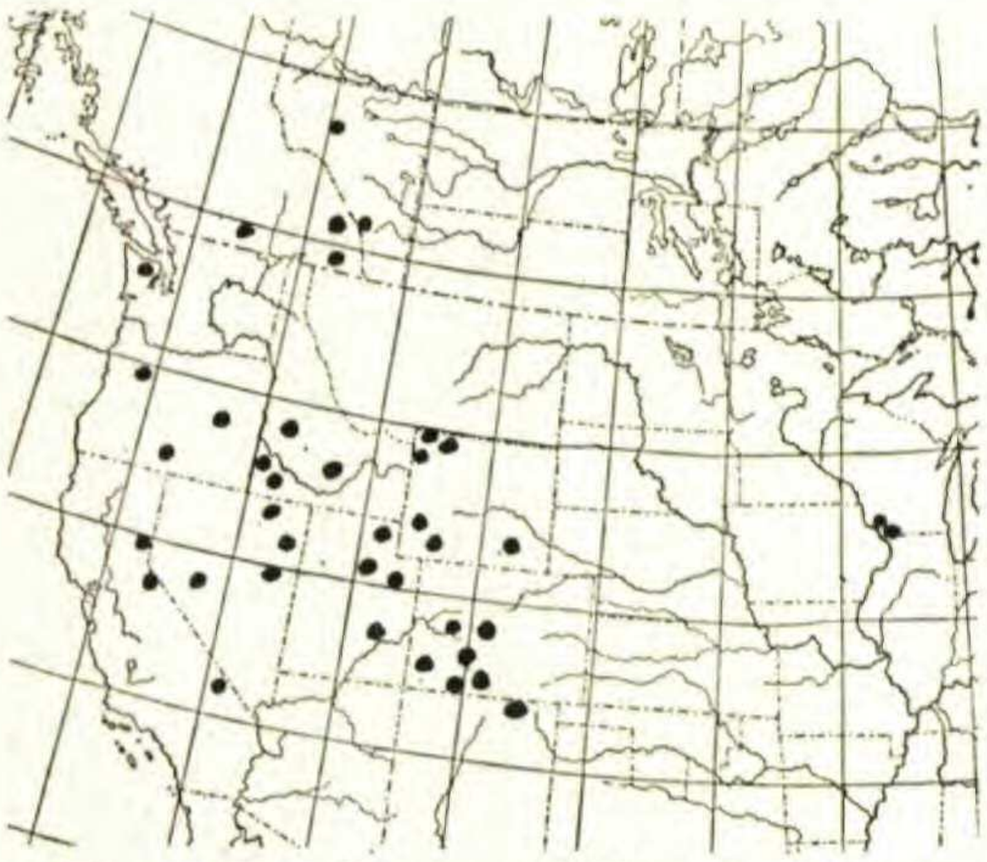
Map 9. Range of Arabis pycnocarpa, var. typica.

Indiana: sandy knoll, 1 mile nw. of Buddah, Lawrence Co., *Kriebel*, no. 1,976; rare on moderately high bank of Eel River, about 2 mi. east of Mexico, *Deam*, no. 40,680 [Deam]; moist wooded bank of Pipe Creek, 2½ mi. n. of Onward, *Deam*, no. 50,215 [Deam]. Wisconsin: near Porcupine Lake, Lake Owen, Bayfield Co., *Griscom*, June 21, 1928; Ephraim, Door Co., *Greenman*, no. 2,169; shaded calcareous cliffs, Ephraim, Door Co., *Pease*, no. 18,011. Illinois: on rocky ledges (dolomite), The Sag, 1 Sept. 1908, *J. M. Greenman;* Ringwood, *Vasey* without number; woods along Desplaines River, Maywood, *Chase*, May 27, 1897. Manitoba: sandhills, north of Carberry, *Macoun & Herriot*, no. 69,857 [Can]; among rocks and on river banks,

Fort Ellice, *Macoun*, no. 1,703 [Can]; ravine, Brandon, *Macoun*, no. 12,400 [Can]. MINNESOTA: slate cliff, northwest exposure, south of Clearwater Lake, Cook Co., *Butters & Buell*, no. 411; sand along dry roadside, near Arago P. O., Hubbard Co., *J. B. Moyle*, no. 486; Fort Snelling, May 25, 1891, *Edgar A. Mearns*. MISSOURI: Oronogo, 3 miles west of Jasper, *E. J. Palmer*, no. 2,535 [Mo]; rocky hillsides, *Eggert*, 17 May 1878 [Mo]. NORTH DAKOTA: prairies, Leeds, *Lunell*, no. 78; Minnewankon, *Lunell*, 26 July 1907 [NY]; dry prairies, *J. F. Brankle*, June 1910 [Deam]. SOUTH DAKOTA: rim of Spearfish Canyon, near Savoy, limestone, elev. 5,600 ft., *J. Murdoch*, no. 4,126; rocky open ground near Rapid City, Pennington Co., *E. J. Palmer*, no. 37,236; Black Hills, Hot Springs, *Rydberg*, no. 518. NEBRASKA: meadow lands, Halsey, *Mell & Knopf*, 9 June 1904 [Mo]; Long Pine, *J. M. Bates*, 28 May 1908 [Bklyn]; Hershey, *C. D. Mell*, 12 June 1903 [US]; Neligh, *R. A. Harper*, 1888 [Wisc]. KANSAS: dry woods, Pottawatomie Co., *J. B. Norton*, no. 611; St. George, Pottawatomie Co., *W. A. Kellerman*, 28 May 1890 [NY]. SASKATCHEWAN: thickets and open prairies, Prince Albert, *Macoun*, no. 12,398 [Can]; thickets, Farewell Creek, Cypress Hills, *Macoun*, no. 10,272 [Can]. ALBERTA: Bankhead, alt. 4,500 ft., *S. Brown*, no. 110; 40–60 miles southwest of Banff, *B. P. Clark*, July–August 1905; Pine Lake Dist., Wood Buffalo Park, *Raup*, nos. 2,496 & 2,498; Crow Nest Pass, lat. 49° 30′, *Macoun*, no. 18,105. MONTANA: Jack Creek Canyon, alt. 7,000 ft., *Rydberg & Bessey*, no. 4,211; South End Pass, Mission Mts., *McDougal*, no. 531 (as *A. ovata*) [NY]; gravelly slope along Appekunny Creek, *Standley*, no. 15,313 [US]. IDAHO: Silver City, Owyhee Co., *Macbride*, no. 991 [NY]; Shoshone Falls, Twin Falls Co., *Nelson & MacBride*, no. 1,731; Wood River, Hailey, *L. F. Henderson*, no. 3,238 [US]. WYOMING: Mt. Leidy, *Tweedy*, no. 390 [NY]; French Creek, Carbon Co., *Goodding*, no. 2,023; shaded banks, Centennial, Albany Co., *A. Nelson*, no. 8,836 [NY]. COLORADO: dry slopes, Brookvale, Clear Creek Co., *Churchill*, 16 June 1918; dry bank of creek, alt. 8,000 ft., Tabeguache Basin, *Payson*, no. 569. UTAH: near Creek, alt. 7,000 ft. Lasal, *Payson*, no. 439; Fish Lake, around Twin Creeks, *Rydberg & Carlton*, no. 7,616 (as *A. ovata*) [NY]; Upper Falls, *O. A. Garrett*, no. 1,746 [NY]. NEW MEXICO: Jemez Springs, *A. Nelson*, no. 11,672; mouth of Ponchuelo Creek, *Standley*, no. 4,076 (as *A. ovata*); *Fendler*, without locality, no. 25 (41). ARIZONA: Buckskin Mts., alt. 9,000 ft., *M. E. Jones*, no. 6,052a [US]; vicinity of Flagstaff, alt. 7,000 ft. *MacDougal*, no. 250; Clarks Valley, *Rusby*, no. 512 [Bklyn]. CALIFORNIA: Burney Falls, Shasta Co., *Baker & Nutting*, 31 May 1894 [US]; Cottonwood Creek, White Mountains, Mono Co., *Coville & Funston*, no. 1,809 [Minn]. OREGON: damp banks of Eagle Creek, Clackamus Co., *J. W. Thompson*, no. 4,266 [Phil]; above Wakkenah Falls, Multnomah Co., *J. W. Thompson*, no. 2,684 [Phil]. WASHINGTON: Pierce Co., *Piper*, no. 232 [US]; no locality, *E. P. Sheldon*, no. 8,107 [US]. BRITISH COLUMBIA: dry bluffs, north bank of Peace

River at Taylor Flat, *Raup & Abbe*, no. 3,581; rich low woodlands, south slopes of Peace River Valley, vicinity of Hudson Hope, *Raup & Abbe*, no. 3,683. Mackenzie: Fort Resolution, *A. Dutilly*, no. 100. Yukon Territory: Cemetery Hill, Dawson, *Eastwood*, no. 437; Carcross, *Eastwood*, no. 703; Klondyke, *John MacLean*, 1898–1901 [Can]; Hawker Creek, *Macoun*, no. 58,381 [Can]; moist ground and rocky banks, Fort Selkirk, *M. W. Gorman*, no. 1,040 [Can]. *Fl.* May–June; *fr.* June–July. Map 9.

Var. **glabrata** (T. & G.), n. comb. Slender; stem glabrous to sparingly hirsute at base, glabrous above: radical and lower cauline leaves glabrous to sparingly hirsute, middle and upper cauline leaves glabrous: sepals membranaceous.—*A. hirsuta*, β *glabrata* T. & G., Fl. N. Am. i. 80 (1838).—Southwestern Wisconsin; Alberta to Washington, south to New Mexico and California. The following are characteristic. Wisconsin: damp cliff, Beetown, Grant Co., *Fassett*, no. 13,369 [Wisc]; limestone cliffs, wooded and pastured bluff along Platte River, Dickeyville, Grant Co., *Fassett*, no. 13,457 [Wisc]. Alberta: vicinity of Basin, 4,600 ft. alt. *S. Brown*, no. 48; Fiddle Creek, Athabasca River, Jasper Park, *without stated collector*, 30 June 1898, no. 19,253 [Can]. Wyoming: on disintegrated formations, Mammoth Hot Springs, Yellowstone Park, *Nelson & Nelson*, no. 5,668; moist semi-wooded slopes, Bates Hole, *Payson & Payson*, no. 4,791; hills east of Afton, alt. 6,500 ft., *Payson & Armstrong*, no. 3,252. Colorado: common in wet places along river bottom, Mancos, *Baker, Earle & Tracy*, no. 36; West Indian Creek, alt. 2,500–2,700 m., *Rydberg & Vreeland*, no. 6,175 [NY]; South Park, Colorado Territory, *Wolf & Rothrock*, nos. 639, 641 & 643; Pagosa Springs, 7,100 ft., *C. F. Baker*, no. 348 (as *A. ovata*). Idaho: grassy bottomlands, Hot Hole, east fork of Bruneau, *Nelson & Macbride*, no. 1,910; moist hillside, alt. 8,000 ft., Lost River Mts., *Macbride & Payson*, no. 3,146; wet grassy swales, alt. 7,000 ft., Silver City, *Macbride*, no. 991. Utah: west fork of Bear R., elev. 8,000 ft., *Payson & Payson*, no. 4,837; Fish Lake, around Twin Creeks, *Rydberg & Carleton*, nos. 7,643 & 7,649 (as *A. ovata*) [NY]; Wahsatch Mts., 6,000 ft., *S. Watson*, Aug. 1869, no. 68 [NY—*not in Gray Herbarium;* Watson's no. 68 in the Gray Herbarium is *A. glabra* collected from a different station in Utah and on a different date]. Nevada: precipitous chapparal slopes, alt. 8,000 ft., Allegheny Creek, *Nelson & Macbride*, no. 2,169; moist



Map 10. Range of Arabis pycnocarpa, var. glabrata.

ravine, Ely, Duck Creek Canyon, *A. E. Hitchcock*, nos. 1,389 & 1,391 [US]; moist ravines, vicinity of Austin, *A. E. Hitchcock*, no. 733 [US]. NEW MEXICO: dry hills, vicinity of Raton, Colfax Co., *Standley*, no. 6,350 [US]. CALIFORNIA: Cottonwood Creek, White Mts., Mono Co., *Coville & Funston*, no. 1,807; Santa Ana River, frequent in shaded damp sand, alt. 6,350 ft., *Munz*, no. 6,324; Truckee, Nevada Co., *C. S. Williamson*, 17 July 1901 [Phil]. OREGON: moist ground along Myrtle Creek, near its confluence with Silvies R., Harney Co., *M. E. Peck*, no. 1,957; wet rocks, Horsetail Falls, Columbia Gorge, *Mrs. N. P. Gates*, no. 106 [Phil]; hills, northwest of Crooked Creek Valley, Lake Co., *M. Loveless*, 22 June 1931 [Phil]. WASHINGTON: rocky slopes of Constance Ridge, Jefferson Co., 3,500 ft., *J. W. Thompson*, no. 6,560 (as *A. furcata*); Washington Territory, *Brandegee*, no. 633 [Phil]. BRITISH COLUMBIA: Lake Osoyoos, between lat. 49° and 45° 05′, and long. 119° 20′ & 119° 30′, *J. M. Macoun*, no. 70,830 [NY]; Glacier, alt. 4,122 ft. *Zoe W. Palmer*, July 1897 (as *A. ovata*) [NY]; Avalanche Path, alt. 4,350 ft., *C. H. Shaw*, no. 37; Mts. near Ainsworth, Kootanie Lake, *collector unknown*, 5 July 1890 [Min]. MAP 10.

MAP 11. Range of ARABIS PYCNOCARPA, var. REDUCTA.

Var. **reducta**, n. var., siliquis brevibus, 1.5–2.5 cm. longis; stylis brevibus pinguis, seminibus 0.6–1 mm. longis, 0.5 mm. latis, late alatis.—Eastern Quebec. QUEBEC: Carlton, gravelly beach, Tracadigash Point, *Collins & Pease*, no. 4,312 (TYPE in Gray Herbarium); ibid, *Collins & Fernald*, no. 4,311; Le Bic, Rimouski Co., *Louis-Marie et al*, no. 34,438a; rocks, Bic, Rimouski Co., *C. S. Williamson*, 18 July 1910 [NY]; cliffs by Bay Orignal, Bic, *F. F. Forbes*, 26 June 1905 [Can]. MAP 11.

Var. **adpressipilis**, n. var., caule pubescente pilis adpressis bifurcatis; foliis caulinis glabris vel subglabris.—River-banks, ledges and bluffs in woods, Ontario to southern Minnesota, south to western Virginia and Missouri. VIRGINIA: Wytheville, Wythe Co., *Shriver & Porter*, 1874 [Phil]. ONTARIO: Point Pelee, Essex Co., *C. K. Dodge*, 3 May 1910 [US]; Wingham, *J. A. Morton*, 14 June 1891 [Phil]. OHIO: Banks of Scioto River, *J. R. Paddock*, 1839 [NY]; Rivière du Scioto, *Lesquereux*, without date or number [NY]. INDIANA: alluvial north bank of Wabash River, about ½ mi. east of Bluffton, *Deam*, 11 July 1906 [Deam]; woods bordering Tippecanoe River just north of DeLong, *Deam*, no. 30,975 [Deam]; rocky bluff of Muscatatuck River, between Vernon & North Vernon, *Deam*, no. 9,116 [Deam]. ILLINOIS:

MAP 12. Range of ARABIS PYCNOCARPA, var. ADPRESSIPILIS.

Lockport Ledge, Lockport, *Skeels*, no. 614; damp open woods near Wady Petra, *V. H. Chase*, 25 May 1895 (as *A. brachycarpa*); banks, Grossdale, *Umbach*, no. 11,544 [Wisc]; railroad track, Romeo, *Umbach*, 4 June 1895 [US]. Missouri: Tower Rock, *H. A. Gleason*, 7 May 1902 (as *Stenophragma Thaliana*); rocks, St. Clair Co., *Eggert*, 7 May 1878 [US]; Montier, *Bush*, no. 32 (type in Gray Herbarium); common on bluffs, Swan, *Bush*, no. 80; on limestone near Moore's Cabin, Allenton, *Letterman*, June 1897 [Mo]. Iowa: woods, Johnson Co., *Fitzpatrick & Fitzpatrick*, 3 June 1900 [Deam]; Badger, *M. P. Somes*, no. A3,023 [US]; rich woods, Chequest Creek, Pittsburg, Van Buren Co., *E. W. Graves*, no. 2,144 [Mo]. Map 12.

*A. pycnocarpa* is the plant which has previously passed in North America as *A. hirsuta* (L.) Scop. The latter is a Eurasian species which, although superficially resembling the American one, actually is quite different from it. These differences are best presented in tabular form as follows:

| | Eurasian A. hirsuta | North American A. pycnocarpa |
|---|---|---|
| Cauline leaves: | remote to subremote, rather scattered along the stem, dentate with 5 (3–)–7 teeth. | usually imbricate to subimbricate, close together on the stem, entire to subentire or if dentate with 1–2 (–4) teeth. |
| Siliques: | rather short, 2–4 cm. long, rather plump, submoniliform to moniliform, the seeds very prominent through the valves of the pod. | longer than in *A. hirsuta*, 3–5 cm., flatter and not so plump as in *A. hirsuta*, not so moniliform as in *A. hirsuta*, the seeds not very prominent through the valves of the pod. |
| Style: | short and thick, 0.1–0.5 mm. long. | longer and more slender than in *A. hirsuta*, 0.5–0.9 mm. long. |
| Seeds: | winged narrowly only at the apex. | winged all around narrowly, but very broadly so at apex. |
| Nervation of silique: | one-nerved to tip. | one-nerved only to middle of silique or slightly beyond middle. |

The pubescence of both plants, however, seems to be similar, although that of *A. hirsuta* is much more abundant than that of its North American relative. The former plant usually possesses on its stem a great quantity of spreading bifurcate hairs along with the characteristic simple ones, while the cauline leaves are much more hirsute than those of *A. pycnocarpa*. The size of the flower and the length of the anthers is also similar in both plants, and although the sepals tend to vary somewhat in the Eurasian plant, in general they are shorter

than those of the American and appear to be only one-half the length of the petals instead of two-thirds their length as is the case in *A. pycnocarpa*. FIG. 1 of PLATE 457 shows a typical specimen of *A. hirsuta* from Bavaria with the characteristic short moniliform pods and remote to subremote, dentate cauline leaves; these characters instantly differentiate it from a typical specimen of *A. pycnocarpa* from Bonaventure County, Quebec, possessing longer and non-moniliform pods and imbricated, entire leaves, and illustrated in FIG. 1 of PLATE 458. FIG. 3 of PLATE 458 illustrates the differences in the nervation of the silique and in the length of the style, the specimens being taken from the above two sheets. The Bavarian plant is characterized by its short style and by a silique which is one-nerved throughout its entire length, whereas the Quebec plant has a longer, more slender style and a silique which is one-nerved only to the middle. Seed differences between the two species are illustrated in FIG. 2 of PLATE 457, and in FIG 2 of PLATE 458, in which the seeds of *A. hirsuta* are shown with a narrow wing only at the apex, while *A. pycnocarpa* possesses a definite wing extending throughout its entire periphery, although this wing is much broader at the apex than elsewhere.

When Rydberg published his Flora of the Rocky Mountains in 1917, he used the name *A. ovata* (Pursh) Poir. for the plant commonly known at that time throughout North America as *A. hirsuta* (L.) Scop., and in his Flora of the Prairies and Plains in 1932 he continued to use it, and was followed by Small in 1933, whose Manual of the Southeastern Flora erroneously cites Michaux as the authority for the name. *A. ovata* is based on Pursh's *Turritis ovata*,[1] and although Mr. C. A. Weatherby has most kindly searched the important herbaria at Paris and London, and effort has been made to locate the Pursh type in this country, it appears either to be non-extant or else hidden in some unconsulted herbarium. There is, however, in the Barton Herbarium of the American Philosophical Society,[2] a specimen collected by Pursh in "shady woods below Harper's Ferry" and labelled by him "*Turritis? hirsuta! P.*", which is, unfortunately, quite clearly merely *A. canadensis* L. Dr. F. W. Pennell, Curator of the Herbarium of the Academy of Natural Sciences of Philadelphia, in a letter to Professor Fernald writes: "We are adding to our loan of specimens . . . eight sheets of Pursh's specimens represented in the Barton Herbarium of the American Philosophical Society. Among

[1] Pursh, Fl. Am. Sept. ii. 438 (1814).
[2] Deposited at the Academy of Natural Sciences of Philadelphia.

these you will find *Turritis hirsuta* which I think is the specimen that must have later formed the basis of his *T. ovata*."[1] But whether Pursh actually labelled any specimen *T. ovata*, and whether such a sheet is preserved today, cannot be answered here. The description in his Flora reads:

> *ovata*. 2. T. pubescens; foliis radicalibus petiolatis ovatis dentatis obtusis, caulinis amplexicaulibus oblongis serratis acutis. On rocks: Pensylvania to Virginia. ♂. May, June. Resembles *T. hirsuta*.

One is, however, puzzled by the words "Resembles *T. hirsuta*," and it is difficult to understand his interpretation of that plant. Was it the sheet which is today in the Barton Herbarium, or was it the European plant described by Linnaeus, with which he must certainly have been familiar? This question will remain unanswered until the specimen labeled "*T. ovata*" by Pursh himself, if it exists, is seen. It seems quite logical that Rydberg used the name *A. ovata* for the American plant at present under discussion, because he realized that it was distinctly different from the European *A. hirsuta* (L.) Scop., and consequently, selected it as best fitting the species. Pursh's description is so vague and concise that either *A. patens* Sullivant, *A. canadensis* L. or *A. pycnocarpa*—and perhaps even *A. glabra* (L.) Bernh.—might be taken for it.

One more name must be mentioned. Rafinesque described a *Turritis oblongata*,[2] which, from his unusually lucid account, might well be our plant, but the publication of an *Arabis oblongata* by Wenderoth in 1824,[3] automatically invalidates the use of that specific name again under the genus *Arabis*. Hence, I have found it necessary to propose for the North American plant the new name, *A. pycnocarpa*.

In eastern North America var. *typica* reaches its northeastern limit in the Gaspé Peninsula, although in western Canada it extends north to the Yukon region and Alaska. In a southern direction it extends to northern Georgia where Ravenel collected it in Floyd Co., on the banks of the Coosa River near Rome, although from the region between Pennsylvania and Georgia I have seen no specimens; and westward it is found through the prairie states to Colorado. I have

[1] In the Letter Files of the Gray Herbarium of Harvard University, Cambridge, Massachusetts.

[2] Rafinesque in the American Monthly Magazine, ii. 44 (1817).

[3] Wenderoth in Hort. Marb. (1824), acc. to Steudel. Wenderoth was the Director of the Botanic Garden of the University of Marburg, Germany, and although this name was published in some report of the Garden, I have been unable to find said publication or its page.

not examined any specimens from Arkansas and Oklahoma, nor have I seen any from Kentucky or Tennessee, although Gattinger lists it as indigenous to the latter state[1] and Professor H. M. Jennison of the University of Tennessee writes: "With reference to *A. hirsuta* (L.) Scop., I can say that we have in our herbarium a specimen of what answers the description of that species which I collected at Savage Gardens near Coal Creek, Anderson Co., in 1934, in the spring."[2] It extends westward to California, Washington and southwestern British Columbia, where it seems to be rather rare and to be much more commonly represented by var. *glabrata*, which in those regions is found in great abundance. In southern California it is represented by a little known species of which more material is needed, while in the northern Pacific States two closely related species are found in abundance.[3]

Var. *reducta* is characterized by its very small siliques which average only 2 cm. in length, by its short and stout style, by its small and broad seeds which are winged all around and by the fact that the nerve on the silique extends to the tip. Furthermore the basal leaves, stem and cauline leaves possess a setose type of pubescence which is longer and coarser than that of typical *A. pycnocarpa*. It is localized in eastern Quebec and only two stations are known—both of them in areas apparently free from recent glaciation. From the European *A. hirsuta*, this Quebec plant differs in its non-moniliform pods which are plumper than in typical *A. pycnocarpa*, in its seeds which are broader and more widely winged than those of *A. hirsuta*, and in its general habit which is more dwarfed.

Var. *adpressipilis* is, in habit, quite similar to the typical form of the species, but in the details of its pubescence quite different. Instead of the spreading hairs so characteristic of the stem of var. *typica*, this plant possesses bifurcate and occasionally trifurcate hairs which are closely appressed to the stem. The cauline and basal leaves are in general more nearly glabrous than those of the typical form of the species and in some cases the entire plant, except for the appressed pubescence on the stem, is quite glabrous. It is found locally from southern Ontario to southern Minnesota, south to western Virginia and Missouri, inhabiting the rich alluvium of river-banks or ledges and cliffs in deep rich woods.

[1] Gattinger, Fl. Tenn. 89 (1901).

[2] Letter from Prof. H. M. Jennison in Letter Files of the Gray Herbarium of Harvard University.

[3] *A. rupestris* Nutt. and *A. Eschscholtziana* Andrz.

Var. *glabrata* was described by Torrey & Gray as "whole plant glabrous; leaves mostly entire."[1] However, I have never seen a plant which was totally glabrous, nor have I had the good fortune to examine the type-sheet: "Oregon, *Dr. Scouler!*" In view of the fact that I have not seen the type-sheet, I have found it necessary somewhat to amend the original description and to include under the varietal name those plants of *A. pycnocarpa* which tend towards a glabrous condition. The present conception of var. *glabrata*, then, is a plant which possesses few siliques, comparatively few cauline leaves, the middle and uppermost of which are glabrous and remote to subremote, membranaceous sepals which are often, but by no means always, somewhat broader and more acute than those of the typical form of the species, glabrous to sparingly pubescent basal leaves, and a stem which is almost invariably hirsute at the base but which rapidly becomes glabrate shortly above that point and is completely glabrous just below the inflorescence. Furthermore, var. *glabrata* is usually simple, slender and rather delicate, and often is very low, although some specimens attain the height of var. *typica*. It is found in the Wisconsin Driftless Area and in the mountains from Alberta south to Colorado and California, extending as far south in that state as the San Bernardino Mountains. It reaches New Mexico only locally; in Oregon, Washington and southwestern British Columbia it is far more abundant than var. *typica*, which occurs on the Sierra Nevada very sparingly as far south as northern California. Its presence in the famous Driftless Area of southwestern Wisconsin is somewhat unusual, but quite logical in view of the current geological interpretation of that region, which was completely untouched by ice during the glacial period. The only two specimens from that state which I have seen are from Grant Co., and both plants are almost entirely glabrous, have very few siliques and possess the slender and delicate habit so characteristic of this plant in the Rocky Mountains.

7. A. GEORGIANA Harper. Biennial from a thin tap-root: stem slender, erect, simple or branched at base, 3–5 dm. high, hirsute at base passing upwards to hirtellous and glabrous with simple and bifurcate subappressed to spreading hairs: radical leaves oblanceolate, forming a flat rosette, denticulate to serrate, obtuse, tapering to a narrowly winged petiole, 4–8 cm. long, 9–12 mm. broad, finely and loosely pubescent on both surfaces with minute bi- or tri-furcate

[1] T. & G., Fl. N. Am. i. 80 (1838).

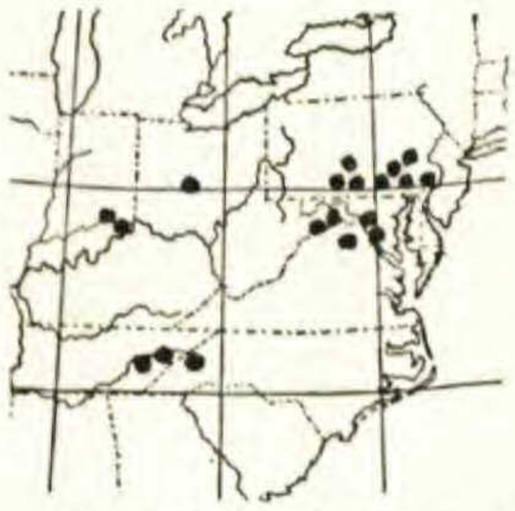
hairs or the upper surface glabrous; cauline leaves 2–4 cm. long, 4–13 mm. broad, subremote to subimbricate, elliptic-oblong to oblong-lanceolate, the uppermost narrower and reduced in size, sessile with a subamplexicaul base, denticulate to subdentate, obtuse, glabrous on upper surface, loosely and finely pubescent on lower surface with minute trifurcate and simple hairs: flowers in loose or somewhat compact racemes, small; flowering pedicels filiform to subfiliform, erect, 5–10 mm. long at anthesis, glabrous; sepals membranaceous, greenish to yellowish, one half the length of petals, ovate-oblong, 2.5–4 (4.5) mm. long, narrowly scarious-margined, glabrous or very rarely sparsely hirsute; petals white to cream, narrowly spatulate to oblanceolate, obtuse, spreading above, 6–9 mm. long: siliques thin, slender, erect or ascending, 5–7 cm. long, 0.75–1 mm. broad, straight or slightly curved, glabrous, one-nerved at least to middle and frequently to top; fruiting pedicels erect or ascending, glabrous, 8–14 mm. long; stigma cupulate, on a style 1–1.75 mm. long; seeds in one row, oblong to oblong-quadrate, averaging 1.5 mm. long, 0.5–0.75 mm. broad, narrowly winged all around but broadly so at apex.—Torreya, iii. 88 (1903); Small, Man. Se. Fl. 571 (1933).—River banks, moist rocks and rich alluvium, Georgia and Alabama. The following are characteristic. GEORGIA: shaded bank of Chattahoochee River, Cretaceous region, *Harper*, no. 1,091 (TYPE in Herb. N. Y. Bot. Gard.); Chatahouchee River, 20 miles from Columbus, *Dr. Boykin*, Aug. 26, 1841 (as *A. hirsuta*) [NY]; Mts. of Georgia, *Herb. Chapman* (without date or number) [NY]; bank of Oostanaula River near Resaca, *Harper*, Dec. 30, 1903 (merely remnants of pods and stalks) [NY]. ALABAMA: bank of Coosa River, below Wetumpka, Elmore Co., Cretaceous region, *Harper*, no. 86; shaded rocks, Pratt's Ferry, Bibb Co., *C. Mohr* (as *A. dentata*). *Fl.* April–May; *fr.* May–June. MAP 13.

MAP 13. Range of ARABIS GEORGIANA.

*A. georgiana*, partly of the coastal plain and partly of the mountains, was first described by Harper in 1903, and although originally found in Georgia its range has since been extended into Alabama. It is most nearly related to *A. pycnocarpa* from which it differs in its larger flowers, longer and flatter siliques, longer style, glabrous upper surface of the leaves, longer fruiting pedicels and narrower seeds. From *A. patens* Sulliv. it differs in its longer siliques, and the shape, margin, base and pubescence of its cauline leaves. In *A. patens* the cauline leaves are ovate to ovate-lanceolate, dentate to serrate, definitely clasping and hirsute on both surfaces, whereas in this plant they are oblong to oblong-lanceolate, denticulate to subdentate, sessile with a sub-amplexicaul base and pubescent only on the lower surface.

When it originally appeared, Harper's statement that "this seems to be the first *Arabis* reported from the coastal plain of the eastern United States with the exception of *A. virginica* (L.) Trel.—which, however, is only a weed in the coastal plain"[1] was entirely accurate. But in the light of more adequate information it needs slight modification. He has himself since collected *A. canadensis* from the coastal plain of Georgia, and we now know coastal plain stations also for *A. lyrata* and *A. Drummondi*.

8. A. PATENS Sullivant. Biennial tending towards perennial: stem erect, 3–6 dm. high, simple or branched at base and above, hirsute throughout with spreading, simple or rarely forked hairs, or glabrous above: radical leaves ovate to oblanceolate, 1.5–6 cm. long, 0.5–1.5 cm. broad, petiolate, serrate to dentate, obtuse or acute, hirsute on both surfaces with simple or forked hairs or entirely glabrous; cauline leaves ovate to oblong-lanceolate, 2–5 cm. long, 1–2 cm. broad, sessile, amplexicaul with an auriculate-clasping base, acute to acuminate, serrate to dentate or the uppermost often entire, hirsute on both surfaces with mostly simple or a few stellate hairs: flowers in rather loose racemes; flowering pedicels ascending or erect, glabrous or sparingly hirsute, 5–10 mm. long at anthesis; sepals membranaceous, 2.5–4 mm. long, sparingly hirsute to glabrous, about one half the length of petals; petals white, 5–7 mm. long, broadly spatulate to obovate: siliques 2.5–4.5 cm. long, 0.5–1 mm. broad, attenuate, glabrous, straight or slightly curved inward, suberect or divergently ascending, strongly one-nerved to the middle and often to the tip; fruiting pedicels ascending or divergent, glabrous, 9–18 mm. long at maturity; stigma small, round, on a conspicuous slender style, 0.5–2 mm. long; seeds in one row, oblong to elliptical, averaging 1.25 mm. long, 0.5 mm. broad, narrowly winged all around or more rarely winged only at the apex.—Am. Journ. Sci. xlii. 49 (1842); Gray, Genera, i. 142, t. 58 (1848); Gray, Man. 69 (1848); Chapman, Fl. S. U. S. 27 (1860); Wood, Classbk. ed. of 1861: 232 (1861); Watson in Gray, Synop. Fl. N. Am. i. 162 (1895); Britton & Brown, Ill. Fl. ii. 148 (1897); Britton, Man. Fl. 464 (1901); Rydberg, Fl. Pr. & Pl. 382 (1932); Small, Man. Se. Fl. 571 (1933).—Rocky places along rivers and creeks, Pennsylvania to Tennessee and Indiana. The following are characteristic. PENNSYLVANIA: banks, Schuylkill River, above Conshohocken, *E. Darlington*, 23 Sept. 1866; York Furnace, York Co., *S. Brown*, no. 4,484 [Phil]; Ivy Rock, *I. A. Keller*, 9 May 1896; Mercersburg, *Porter*, 11 June 1850. MARYLAND: near Great Falls of Potomac, *Bartram*, 11



MAP 14. Range of ARABIS PATENS.

[1] Harper in Torreya, iii. 88 (1903).

April 1909; Broadwater, *C. S. Williamson*, 17 April 1908 [Phil]. DISTRICT OF COLUMBIA: in vicinis Washington, *L. F. Ward*, 8 May 1881; common throughout the Carberry meadows, Georgetown, *E. L. Morris*, no. 1,365 [Bklyn]. WEST VIRGINIA: on rocky cliffs, Smoke Hole, Pendleton Co., *E. L. Core*, no. 6,816 [NY]; Smithfield, *E. T. Harper*, 10 Aug. 1894 [Wisc]. VIRGINIA: near Front Royal, rocks at Allen's Cove, Warren Co., *G. S. Miller*, 17 July 1897 [US]. NORTH CAROLINA: Hot Springs, Madison Co., *C. E. Smith*, April 1888 [Phil], *Churchill*, 5 June 1899; Warm Springs, Madison Co., *J. D. Smith*, 28 July 1880 [US]. OHIO: rocky banks of Scioto River (limestone), Columbus, *Aug. D. Selby;* Scioto River, near Columbus, the original locality from which Sullivant obtained his specimens in 1842, *Kellerman, Fullner & Selby*, 1899; Columbus, *Sullivant*, 1840 [TYPE in Herb. Acad. Nat. Sci. Phil.; ISOTYPE in Herb. Gray, both as *A. hirsuta* var.]; near Columbus, *W. C. Werner*, 24 May 1891 [US]. INDIANA: on limestone in woods along Salt Creek, ½ mi. north of Hartsville, Bartholomew Co., *Mrs. C. C. Deam*, no. 36,914; talus at base of cliff along Blue River, 1 mi. north of Whitecloud, *Deam*, no. 42,222 [Deam]. TENNESSEE: on rocks along Tennessee River, Knoxville, *Ruth*, no. 357; Dandridge, *Buckley* without date or number; ad French Broad River, prope Dandridge, *Rugel*, April 1842; vicinity of Knoxville, *Lamson-Scribner*, April 1890 [NY]. *Fl.* April–June; *fr.* May–Sept. MAP 14.

The broad and clasping cauline leaves of *A. patens* are in striking contrast to those of *A. pycnocarpa*, with which species the plant has often been confused. In *A. patens* the pods are ascending but quite unappressed and stouter and broader than in *A. pycnocarpa;* the style is much longer; the pubescence of the stem is much more hirsute and crowded; and the flowers larger and very conspicuous.

The habitat of *A. patens* seems to be rocky and shady river-banks from Pennsylvania south to Tennessee, and west to Ohio and Indiana. It has been reported from Kentucky[1] and from Alabama[2] but I have been unable to substantiate these reports by an examination of actual specimens. It has likewise been reported from Minnesota by MacMillan who says of it "reported as local"[3] and refers to Upham[4] who first recorded the station. But Professor F. K. Butters of the University of Minnesota has shown rather definitely[5] that this record is

[1] Linney, Bot. Madison Co., etc. 28 (1882).

[2] Mohr, Plant Life of Alabama 528 (1901).

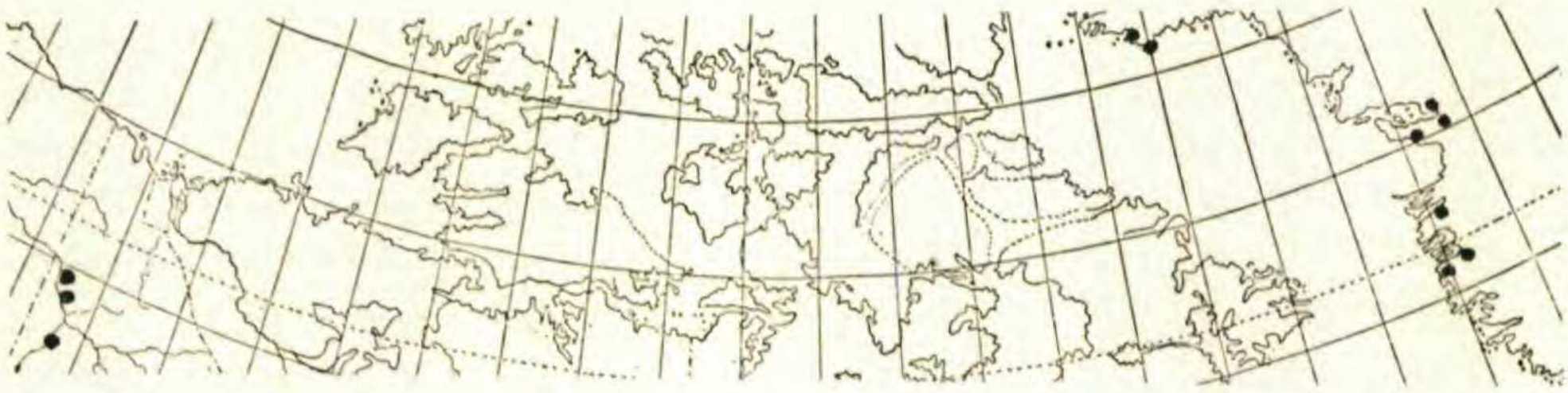
[3] MacMillan, Metaspermae of the Minnesota Valley, 268 (1892).

[4] Upham, Supplement to the Flora of Minnesota, 46 (1887).

[5] Letter from Prof. F. K. Butters to Mr. C. A. Weatherby, Asst. Curator of the Gray Herbarium of Harvard University, Cambridge, Mass.; "We have no Minnesota specimens of *A. patens* and I don't think it occurs here. Unfortunately, Upham did not keep the specimens upon which he founded his reports, and his identifications were often pretty shaky. Of course it is very difficult to prove a negative, but where continued collection in a region fails to turn up a plant reported by Upham, we are

exceedingly dubious. Another doubtful station for the plant has been reported from Missouri[1] but this seems unquestionably to be incorrect as no specimen from that state is to be found in any of the herbaria nor do Palmer and Steyermark mention it in their Annotated Catalogue of the Plants of Missouri.[2]

9. A. Hookeri Lange. Biennial from a tap root or perennial from a branched root-stock: stem ascending or erect, profusely branched at base or more rarely simple, varying from 1–4 dm. high, densely hirsute below with usually long simple or often bifurcate spreading hairs, passing to glabrous above or more rarely hirsute throughout: basal leaves in a dense crown, oblanceolate to linear-lanceolate, 3–5 cm. long, 3–7 mm. broad, acute, sinuate to dentate or subentire, finely and densely stellate-pubescent on both surfaces with minute forked trichomes; petioles narrowly wing-margined, pilose; cauline leaves re-



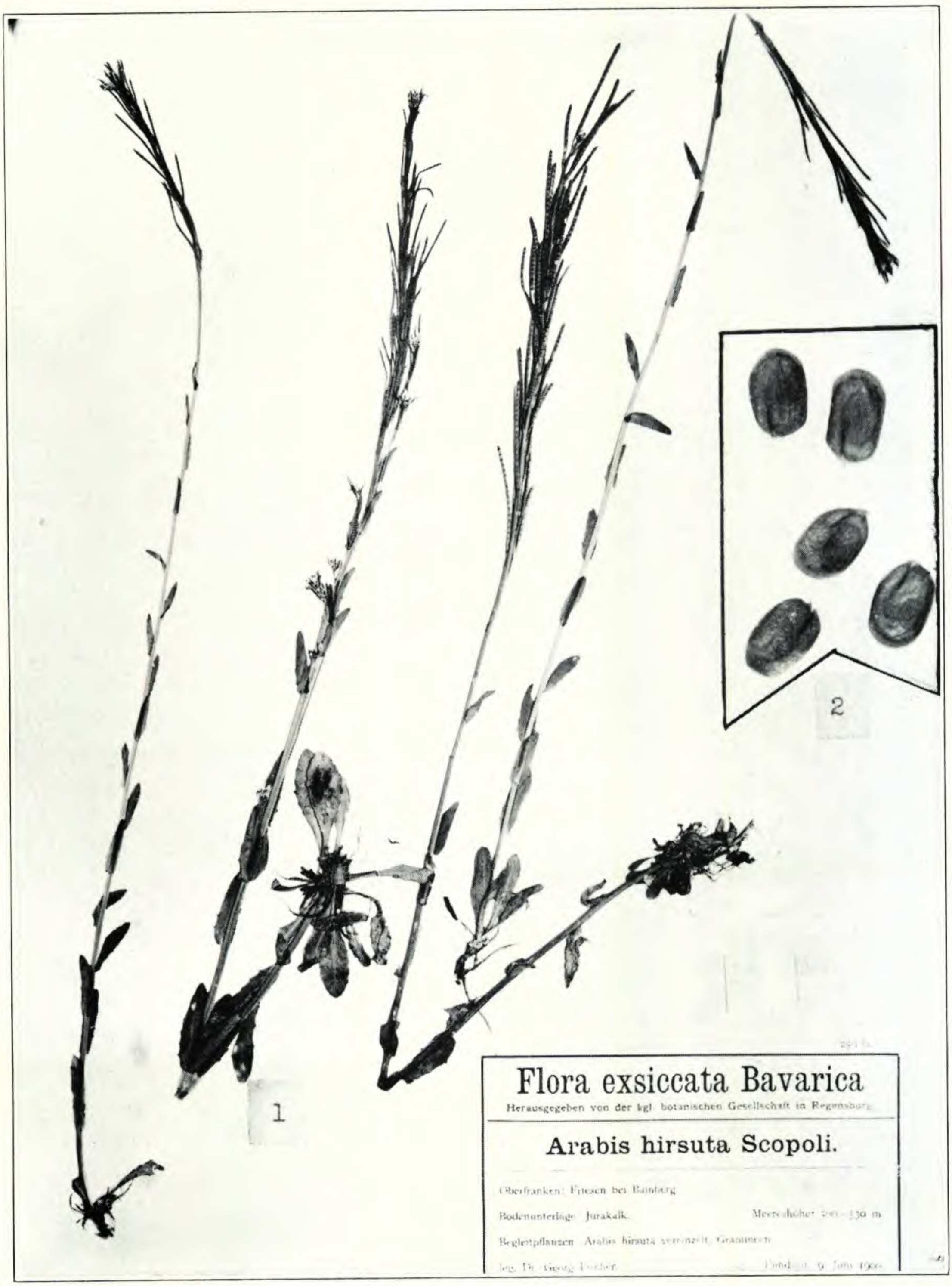
Map 15. Range of Arabis Hookeri.

mote to subimbricate, lanceolate to linear-lanceolate, sessile with a sagittate or an auriculate clasping base, usually entire or more rarely subdentate with scattered teeth or slightly subsinuate, revolute, 1–2 cm. long, 1–3 mm. broad, the lowermost finely and densely stellate-pubescent, the uppermost less so; the hairs minute, both simple or forked: flowers in loose racemes, small; flowering pedicels erect or ascending, 3–7 mm. long at anthesis, sparingly pilose or more rarely glabrous; sepals oblong, obtuse, 1–1.5 mm. long, membranaceous, ½ length of petals, pilose with simple or more rarely forked hairs, subhyaline or yellowish along margin; petals small, white to pale cream color, 2.5–4 (–4.5) mm. long, oblanceolate: siliques straight or slightly curved inward, glabrous, attenuate, 1.5–3.6 cm. long, 1.5–2.5 mm. broad, strongly ascending, distinctly and prominently one-nerved

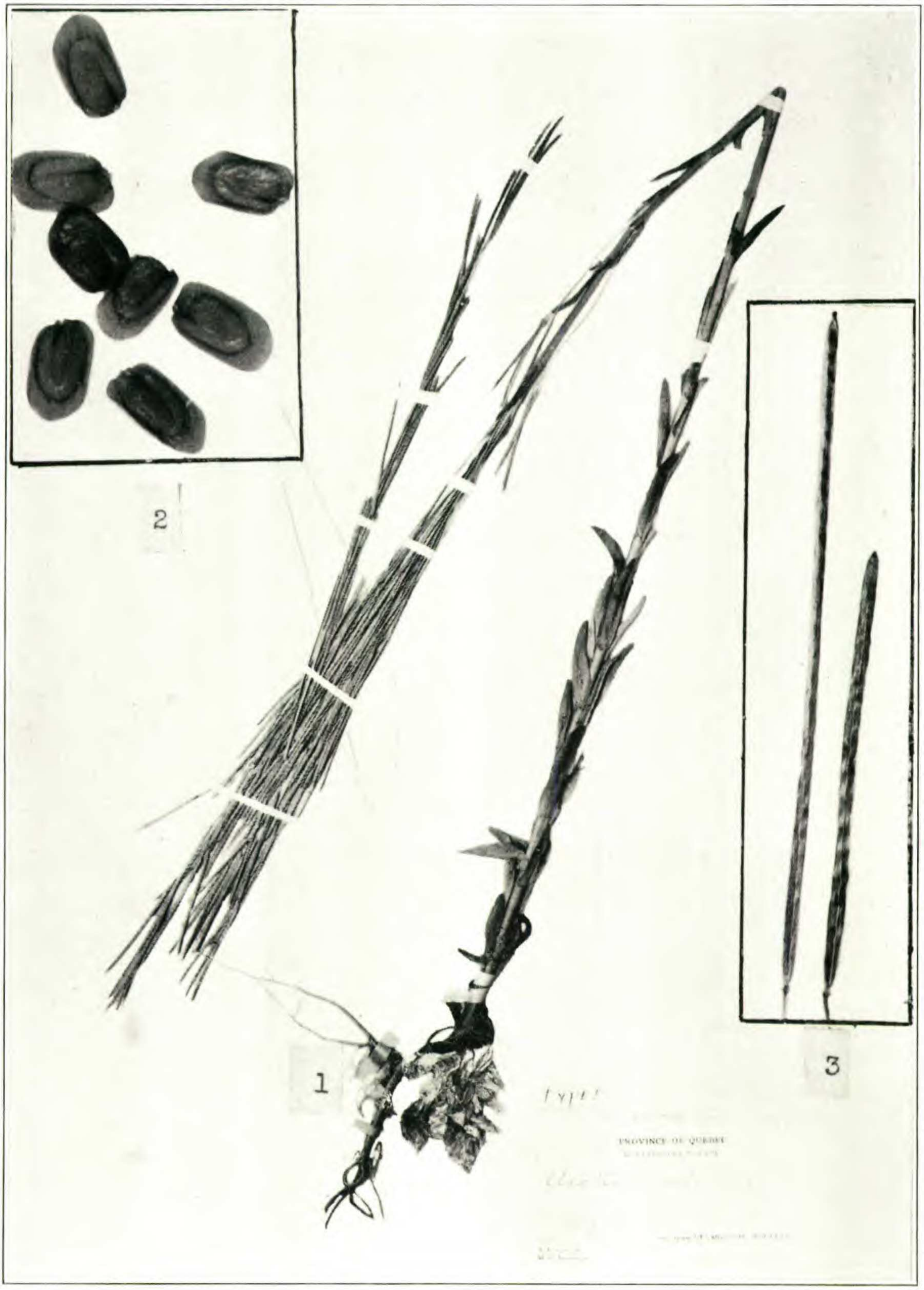
inclined to read it out of our flora and attribute his report to misidentification. I find that in my copy of Gray's Manual I have '*Minnesota*' crossed out in the range of *A. patens*, and '*Ohio*' written in. This must have been done nearly twenty years ago. Incidentally, there has been quite a lot of collection in the vicinity of Mankato (the station which is reported by Upham), and I think that if the plant occurs there, it would have turned up."

[1] Reported, no doubt erroneously, by S. M. Tracy in Cat. Phaenogam. & Crypt. Pl. of Missouri, 10 (1886). No other author records it from the state.

[2] Palmer & Steyermark, Ann. Cat. Pl. of Missouri in Ann. Mo. Bot. Gard. xxii. 375–758 (1935).




ARABIS HIRSUTA: FIG. 1, plants, × ⅖; FIG. 2, seeds, × 10.




ARABIS PYCNOCARPA: FIG. 1, type-specimen, × ⅔; FIG. 2, seeds, × 10; FIG. 3 (left), fruit, × 2.
A. HIRSUTA: FIG. 3 (right), fruit, × 2.

nearly to tip; fruiting pedicels erect or ascending, sparingly pilose to glabrous, slender, 7–13 mm. long at maturity; stigma small, flat, not cupulate, on a style 0.25–1 mm. long; seeds in two rows, narrowly elliptical to narrowly oblong, wingless, averaging 1.2 mm. long, 0.5 mm. broad.—Consp. Fl. Groen. iii. 50 (1880); Warming in Bot. Tidsk. xv. 163 (1886); Rosenvinge, Groen. Fanerogam. 673 (1892); Abromeit in Bot. Ergebn. ii. 27 (1899); Simmons, Rep. 2nd. Arct. Exped. 1898–1902, no. xvi. 68 (1909); Porsild, Vasc. Pl. W. Greenland, 376 (1912); Porsild, Fl. Disko, 83 (1926). *Turritis mollis* Hooker, Fl. Bor.-Am. i. 40 (1829); Hornem., Fl. Dan. xiii. t. 2296 (1836); Torr. & Gray, Fl. N. Am. i. 78 (1838); Walpers, Rep. i. 169 (1842); Dietrich, Synop. iii. 688 (1843); non *Arabis mollis* Steven in Mem. Soc. Nat. Mosc. iii. 270 (1812). *A. Hookeri* β *breviramosa* Abromeit in Bot. Ergebn. ii. 28 (1899). *A. Hookeri* var. *multicaulis* Simmons, l. c. 68; Ostenfeld, Medd. Groenld. lxviii. (reprint p. 12), Fl. Pl. & Ferns Greenland (1925).—West Greenland and Yukon Territory. The following are characteristic. GREENLAND: Etah, W. Greenland, *R. Robinson*, no. 31; in sinu Foulke Fjord (lat. 78° 18′) ad Etah, *Simmons*, no. 1,466 (TYPE of *A. Hookeri* var. *multicaulis*); Etah region, loamy grassy slope at head of fjord, lat. 78° 20′, long. 72° 30′, *Ekblaw*, nos. 384 and 385. YUKON: along cliffs, Klondike River, *Macoun*, no. 58,361 [Can]; hills along Klondike River, *Eastwood*, no. 117 [Can]; river-banks near mouth of Lewis River, *M. W. Gorman*, no. 1,024 [Can]. *Fl.* June–July; *fr.* July–Aug. MAP 15.

This unique Arabis is found on the western and northwestern coasts of Greenland and is represented in several herbaria which I have examined solely from that region. Abromeit remarks: "in Ostgrönland nicht beobachtet (in east Greenland not yet observed)."[1] Porsild says, in discussing its range in Greenland, "a northern type: south of the area [from 66°–70° lat.] observed in only a few places, the southmost at about 64°. North of the area extraordinary many localities in the southmost part of Nordost-Bugt."[2] And an interesting note regarding its Greenland environment is recorded by A. E. Porsild: "so far as I can ascertain, it has never been collected far from human habitations, and it has most likely been dispersed by man. At Umanaq f. inst. it is very common among the houses together with *Puccinellias*, which in lieu of *Elymus*, are frequently used for straw in the native boots (kamiks). People travelling from Umanaq to other places may easily disperse both the *Arabis* and the *Puccinellias*. Like *Alopecurus alpinus* it is a dung lover."[3]

[1] Abromeit in Bot. Ergebn. ii. 27 (1899).
[2] M. P. Porsild, Fl. Disko Island, 83 (1926).
[3] A. E. Porsild, Contr, Fl. W. Greenl. 176 (1926).

There are, in the Herbarium of the National Museum of Canada, three representative sheets of the plant from the Yukon Territory and there is every good reason to believe that it should be found in the arctic regions intermediate between this locality and Greenland. Hooker states: "Shores of the Arctic Sea between long. 107° and 130°. . . . This plant exists in Dr. Richardson's collection from the shores of the Arctic Sea,"[1] which would be exactly the region anticipated. But Mr. C. A. Weatherby, who has been kind enough to examine the type of Hooker's *T. mollis*, writes me: "labelled in Hooker's hand 'Sea Coast Arctic America, Richardson'." He further informs me that there are no other specimens of the plant in the Hooker Herbarium, so the exact locality of the Richardson plant remains unknown. The Yukon plant seems typical in every way.

In 1909, Simmons, interpreting the mode of growth as being of especial significance in setting aside new varieties, named var. *multicaulis*, based on the opinion that those plants possessing a "tap root carrying a number of branches with dense rosules of leaves and several flowering branches again springing from each rosule, the number of inflorescences thus often amounting to a dozen or more,"[2] were sufficiently different from the typical ones to warrant varietal recognition. A close scrutiny of the specimens at my disposal, however, does not satisfactorily convince me that it is either necessary or wise to separate the plants in such a manner.

Lange's description of *Arabis Hookeri*, based on Dr. Richardson's plant which Hooker had previously described as *Turritis mollis*, contains the following: "Biennis? (v. perennis), multicaulis . . ."[3] which indicates that he undoubtedly had before him just such a plant as Simmons describes. The material which I have examined consists of specimens ranging from low, caespitose plants with several branching caudices to those of four decimeters in height with simple caudices, as well as low plants with simple caudices and tall ones with branching caudices. And several sheets show intermediate forms. It appears more probable that the plants which Simmons refers to his var. *multicaulis* have taken on that habit as an edaphic adaptation. My

[1] Hooker, Fl. Bor.-Am. i. 40 (1829).

[2] Simmons, 2nd Nor. Arct. Exp. 1898–1902. no. xvi. 68. (1909).

[3] Lange, Consp. Fl. Groenl. tredie Hefte. 50 (1880). It was impossible for Lange to change Hooker's *T. mollis* to *A. mollis* because Steven had previously (Mem. Soc. Nat. Mosc. iii. 270 (1812) ) described an *A. mollis*, which is a Eurasian plant and not in any way connected with this one.

reluctance to maintain the variety is increased by the use of "multicaulis" in the original description of the typical form of the plant.

Nor can I conscientiously maintain Abromeit's f. *breviramosa* as a separate form. His comment and description read: "Namentlich die D r y g a l s k i schen Exemplare erwecken den Eindruck unverästelter einfacher Pflanzen, wodurch sie beträchtlich von der Tracht der typischen Form abweichen. Die kurzen blütentragenden Aste sind stets kürzer als die Stengelblätter, in deren Achseln sie entspringen. Im übrigen tragen die Exemplare den Charackter der *A. Hookeri*. Auch diese Form, die ebenfalls sehr reichblütig ist, dürfte nur zweijährig sein."[1] Typical *A. Hookeri* possesses such widely diverse habits, due to environmental factors, that it seems quite hopeless to attempt to segregate these as varieties and forms, especially since all the other characters of the plant are quite constant.

10. A. DIVARICARPA Nelson. Biennial or rarely perennial: stem erect, 2–9 dm. high, branched at base or above or simple, finely and sparingly hirsute at extreme base with appressed simple or forked hairs or glabrous throughout: radical leaves oblanceolate-spatulate to narrowly oblanceolate in basal rosettes, 2–6 cm. long, 4–10 mm. broad, acute, dentate to denticulate or very rarely subentire, finely and evenly pubescent on both surfaces with minute stellate hairs, petiolate, the petioles very narrowly winged and finely stellate-pubescent; cauline leaves narrowly oblong to linear-lanceolate, imbricate to subremote, erect or strongly ascending, 1.5–6 cm. long, 3–10 mm. broad, sessile with an auriculate or sagittate base, acute, the extreme lowermost subentire to entire, the uppermost quite entire, glabrous on both surfaces or very rarely the extreme lowermost occasionally sparingly stellate-pubescent: flowers in loose racemes; flowering pedicels ascending when young, becoming wide-spreading or somewhat reflexed at anthesis, glabrous or more rarely slightly stellate-pubescent, 6–7 mm. long at anthesis; sepals 2–4 mm. long, 1–1.25 mm. broad, ½ the length of petals, linear to narrowly oblong, herbaceous, essentially glabrous, or more rarely with a few scattered stellate hairs, green with a whitish or hyaline margin; petals pinkish to pale purple, rarely white, oblanceolate-spatulate, 5.5 (5)–8 mm. long, 0.5–1.5 mm. broad at apex: siliques straight or subarcuate, the uppermost and youngest suberect, the lowermost and older suberect to widespreading or subarcuate or subreflexed, glabrous, 2.5–9 cm. long, 1.25–2.5 mm. broad, prominently one-nerved two thirds of their length or often to the tip, fruiting pedicels ascending or divaricately spreading or more rarely subdeflexed, glabrous, 5–12 (14) mm. long at maturity depending on robustness of plant; stigma small, on a short style 0.25–0.5 (0.75) mm. long; seeds when young definitely in

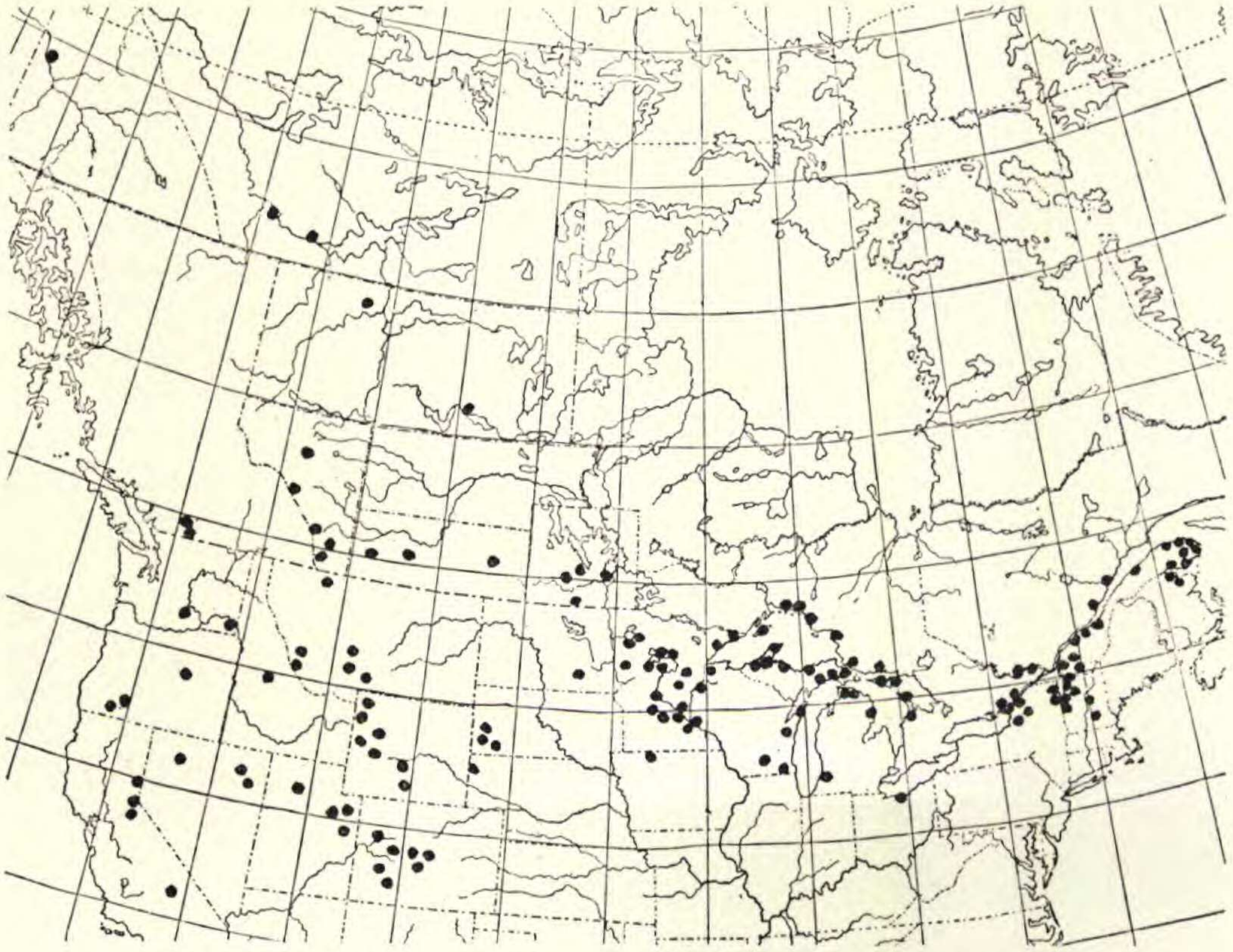
[1] Abromeit, l. c.

two rows but at maturity usually only in one due to abortion of one series, orbicular to oblong, 1–1.5 mm. in diameter, narrowly winged all around. Two varieties occur in eastern North America.

Siliques 1.25–2.25 (–3) mm. broad ..... var. *typica.*
Siliques 0.75–1.25 mm. broad ..... var. *stenocarpa.*

Var. **typica.** *A. divaricarpa* Nelson in Bot. Gaz. xxx. 193 (1900); Coulter & Nelson, Man. Rocky Mt. Bot. 226 (1909); Rydberg, Fl. Rocky Mts. 362 (1917). *Turritis brachycarpa* T. & G., Fl. N. Am. i. 79 (1828); Eaton & Wright, N. Am. Bot. ed. 8: 463 (1840); Walpers, Rep. i. 130 (1842); Gray, Man. 37 (1848). *A. Drummondi* var. *brachycarpa* Gray, Man. ed. 5: 69 (1867). *A. confinis* Watson in Proc. Am. Acad. xxii. 466 (1887) in part; Watson & Coulter in Gray, Man. ed. 6: 67 (1889) in part; Watson in Gray, Synop. Fl. N. Am. i. 163 (1895) in part. *A. confinis* var. *brachycarpa* Watson & Coulter in Gray, Man. ed. 6: 67 (1889); Watson in Gray, Synop. Fl. N. Am. i. 163 (1895). *A. brachycarpa* Britton in Mem. Torr. Bot. Club v. 174 (1894); Brit. & Brown, Ill. Fl. ii. 150 (1897); Britton, Man. Fl. 464 (1901); Fernald in Rhodora v. 231 (1903); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Rydberg, Fl. Rocky Mts. 361 (1917) and Fl. Pr. & Pl. 381 (1932); Marie-Victorin, Fl. Laurent. 261 (1935); non *Arabis brachycarpa* Ruprecht, Fl. Cauc. 73 (1869).—Quebec to central New York, west along the Great Lakes region and Great Plains, thence to Yukon, British Columbia, Washington, Oregon and California. The following are characteristic. Quebec: common in sand dunes, Tadousac, Saguenay Co., *Collins & Fernald,* 1 Sept., 1904; dry rocky bluff above Rivière du Gouffre, near Baie St. Paul, Charlevoix Co., *Stebbins,* nos. 792 and 794 (no. 794 as *A. Drummondi*); sur les sables, La Peninsule, Baie de Gaspé, Gaspé Co., *Victorin, Brunel, Rolland et Rousseau,* no. 17,365; rocky headlands by the Gulf of St. Lawrence east of Marsouin River, Gaspé Co., *Fernald & Pease,* no. 25,112 (as *A. Drummondi*); limestone conglomerate cliffs, peak west of Baptiste Michaud's, Bic, Rimouski Co., *Collins & Fernald,* 16–18 July 1904; sur rochers en compagnie de *Juniperus horizontalis,* Grosse Isle, Montmagny Co., *Victorin et al,* no. 40,030; vicinity of Cap a L'Aigle, *Macoun,* nos. 66,695; 66,696; & 66,697; foot of Eagle's Cliff, Owl's Head Mountain, Lake Memphremagog, *E. Faxon,* 27 & 29 June 1885. New Brunswick: Eel River, Restigouche Co., *John Brittain,* 1 Aug. 1888 (as *A. confinis* var. *brachycarpa*); rocky banks, Campbellton, *Chalmer,* no. 1,674 (as *A. Drummondi*). New Hampshire: Walpole, *W. H. Blanchard,* no. 75 (as *A. laevigata*); Hanover, *C. H. Hitchcock,* 20 June 1883) [NY]. Vermont: dry sandy soil, R. R. embankment, Burlington, *N. F. Flynn,* 12 July 1903; Pease Mt., Charlotte, *Pringle,* Pl. Exsicc. Gray. No. 554; Ferrisburg, *F. H. Horsford,* 17 June 1881, no. 1. New York: lake-shore, Port Henry, *Brainerd,* 27 May 1881; Wells Island, Thousand Islands, *Bicknell,* no. 4,357 [NY]. Ontario: dry banks of the Moira, *Macoun,* no. 134; dry

rocky soil of talus, Ferguson Mt., Temagami Forest Reserve, *W. R. Watson*, no. 976; dry limestone boulders, foot of cliffs, Barrow Bay, Bruce Co., *Stebbins et al.*, nos. 133 and 134; Dunk's Bay, Tobermory, Bruce Co., *Krotkov*, no. 7,461; sandy beach of Lake Superior, Agawa Bay, *Pease*, no. 17,979; dry cliffs, Gore Bay, Manitoulin Island, *Pease & Ogden*, no. 25,019; rocks and sand, Jack Fish, Thunder Bay District, *Pease & Bean*, no. 23,478; barrens, Schreiber, Thunder Bay District, *Pease & Bean*, no. 23,542. MICHIGAN: Isle Royale, *W. S. Cooper*, no. 278; crevices and talus of greenstone bluffs in dry woods



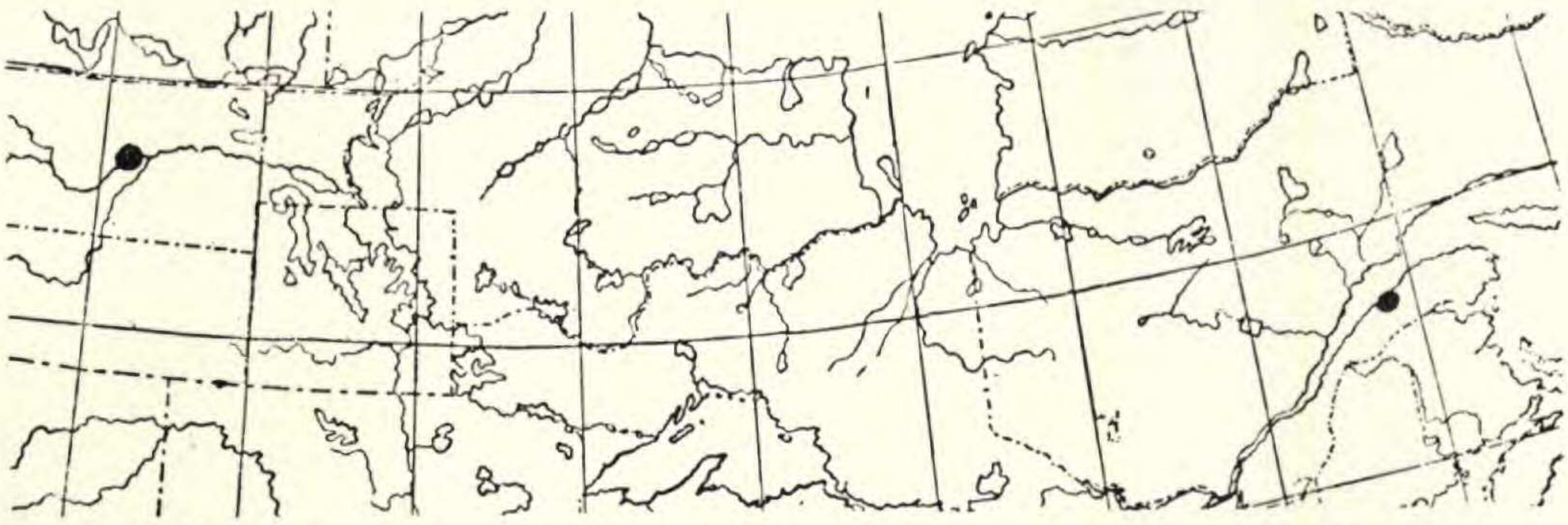
MAP 16. Range of ARABIS DIVARICARPA, var. TYPICA.

near Cliff, *Fernald & Pease*, no. 3,329; open ledges, Mt. Houghton, Keweenaw Co., *Pease & Ogden*, no. 25,188. OHIO: Strontium Island, Lake Erie, near Sandusky, *A. E. Ricksecker*, 28 May 1894 [US]. WISCONSIN: Ephraim, Door Co., *E. J. Kraus et al.*, 30 May 1926; wooded limestone talus, High Cliff, Calumet Co., *Fassett*, no. 16,226; Delavan Lake, Delavan, *S. C. Wadmond*, no. 1,780. MANITOBA: Lake Winnipeg Valley, *Bourgeau*, 1857 and 1859 (both as *T. patula* Graham); Elk Island, Lake Winnipeg, *J. M. Macoun*, 20 July 1884 (as *A. Drummondi*) [NY]; thickets and open prairie, Sewell, *Macoun*, no. 12,373 (as *A. confinis*) [Can]; Carberry, *Macoun & Herriot*, no. 69,862 [NY]; Lothair, *Macoun & Herriot*, no. 69,862a [NY]. MINNESOTA: sand, bank of Lake Itasca, Clearwater Co., *J. B. Moyle*, no.

110; Mississippi banks, *J. H. Schuette*, 1 July 1881 (as *A. laevigata*); Fort Snelling, *E. A. Mearns*, 11 May 1891; talus slope below calcareous cliff, Grand Portage, Cook Co., *Butters & Buell*, no. 368 (as *A. laevigata*). Iowa: dry wood, Iowa Lake, Emmet Co., *Cratty*, 19 May 1900 [Mo]. South Dakota: Elk Canon, Black Hills, elev. 4,000–5,000 ft., *Rydberg*, 29 June 1892, (as *A. Holboellii*) [US]; Custer, Black Hills, alt. 5,500, *Rydberg*, 5 June 1892 (as *A. Holboellii*) [US]. Nebraska: hillside, Kiwa Valley, Scott's Bluff Co., *Rydberg*, 28 July 1891 [US]. North Dakota: on rocks in open woods of hillside, Kathryn, *H. F. Bergman*, no. 1,446 [Mo]. Mackenzie: dry slopes, Fort Simpson, Mackenzie River, *Miss E. Taylor*, 10 July 1899 (as *A. confinis*) [Can]; Fort Providence, Mackenzie, *Preble & Cary*, no. 32 [US]. Saskatchewan: Saskatchewan, *Bourgeau*, 1858 (as *T. patula* Graham); gravelly banks, Clearwater River, lat. 56°, *J. M. Macoun*, no. 1,665 [Can]; prairie, Old Wives Creek, *Macoun*, no. 10,406 (as *A. confinis*) [Can]; thickets, Cypress Hills, *Macoun*, no. 3,072 (as *A. confinis*); rocky and sandy banks of rivers, west of Touchwood Hills, *Macoun*, no. 1,767. · Alberta: trail to Lake O'Hara, *Macoun*, no. 64,517; Pine Lake Dist., Wood Buffalo Park, *Raup*, no. 2,486; below Wapta Lake, *Macoun*, no. 64,513; shore of Waterton Lake, foothills of Rocky Mts., *Macoun*, no. A1,004 (as *A. confinis*); Rocky Mts, *Bourgeau*, 1858 (as *T. retrofracta*); vicinity of Banff, gravelly bank, alt. 5,000 ft., *W. C. McCalla*, no. 2,254 [US]. Montana: dry stony places, Middle Creek, Bozeman, 4,500 ft., *Blankinship*, no. 29 [US]; gravelly roadside, Hudson Bay Divide, about 13 miles west of Browning, Glacier Co., alt. about 6,100 ft., *Hodgdon & Rossbach*, no. 72; drying hillsides above Daly Creek on Skalkaho Road, Granite Co., elev., 7,000 ft., *C. L. Hitchcock*, no. 2,067. Idaho: gravel bar, Squaw Creek near Clayton, Custer Co., *Macbride & Payson*, no. 3,386 [US]. Wyoming: on stony and sandy banks of Yellowstone Lake, *Nelson & Nelson*, no. 6,622 (isotype); gravel flat, Jackson Hole, Lincoln Co., alt. 6,700 ft., *Payson & Payson*, no. 2,194 (as *A. Macounii*); sand bars in Horse Creek, 7 miles west of Merna, Sublette Co., *Payson & Payson*, no. 2,742. Colorado: open forest, vicinity of Como, 10,000 ft. *Crandall & Owen*, no. 42; open rocky bank, mountains above Silverton, San Juan Co., alt. about 9,300 ft., *Hodgdon & Rossbach*, no. 7; Clear Creek, *Wolf & Rothrock*, no. 650. Utah: open flats, Young's Springs, Uintah Mts., *Goodding*, no. 1,198 (as *A. Holboellii*); Weber River Valley, *Hayden*, May–June 1870 [Phil]. Nevada: West Humboldt Mts., 6,000 ft. alt., *S. Watson*, June 1868, no. 74 in part; Martin Creek, Elko Co., *P. B. Kennedy*, no. 4,485 [Phil]. California: near Castle Peak, Nevada Co., *Heller*, no. 7,069 (as *A. columbiana*); Wheats Meadow Ranger Sta., Stanislaus Forest, Tuolumne Co., *Eggleston*, no. 9,282 [US]; Farewell Gap region, Tulare Co., *Culbertson*, no. 4,523 (as *A. Drummondi*); Lake Tahoe Region, *Eastwood*, no. 125 [US]. Oregon: open grassy forest of *Pinus Murrayana*, about 5,900 ft., Crater Lake National Park,

*Heller*, no. 12,630 (as *A. Lyallii*); hill near Dixie Station, Blue Mts., Grant Co., 5,500 ft., *Henderson*, no. 5,291; Ashland Butte, *Henderson*, no. 13 (as *A. hirsuta* var. ?). WASHINGTON: Clemens Mts., Yakima Co., *Henderson*, no. 2,388 in part (as *A. Cusickii*); sandy soil, open ridge and in brush, Godman Springs, Blue Mts., Columbia Co., *Constance et al.*, no. 1,178. BRITISH COLUMBIA: Skagit Valley, between lat. 49° and 49° 15′ and long. 121° and 121° 20′, 5,500 ft. alt., *J. M. Macoun*, no. 70,824; Lake House, Skagit River, *J. M. Macoun*, nos. 70,822 and 70,823 (as *A. columbiana*) [Can]. YUKON: Cemetery Hill, Dawson, *Eastwood*, no. 246. *Fl.* May–June; *fr.* June–Aug. MAP 16.

Var. **stenocarpa**, n. var., siliquis 0.75–1.25 mm. latis.—Calcareous ledges, Quebec and Saskatchewan. The following are characteristic. QUEBEC: ridges east of the village, Bic, *Fernald & Collins*, no. 1,057 (TYPE in Gray Herb.); limestone and limestone conglomerate ridges



MAP 17. Range of ARABIS DIVARICARPA, var. STENOCARPA.

from Pointe aux Corbeaux to Cap Caribou, Bic, *Fernald & Collins*, nos. 1,058 and 1,059; sur le conglomerat nu, Pointe du Vieux, Bic, *Rousseau*, no. 26,391; Le Bic, *Louis-Marie et al.*, no. 24,438. SASKATCHEWAN: near Prince Albert, lat. 53°, *Macoun*, no. 12,376 (as *A. confinis*). MAP 17.

Ruprecht, in 1869, described a plant from the Caucasian region of Eurasia, which he called *A. brachycarpa*,[1] but it is in no way whatever associated with the North American plant which has been passing as *A. brachycarpa* (T. & G.) Britton. According to the homonym rule, Ruprecht's publication invalidates the name "*brachycarpa*" for the plant under discussion, and for it we must take up the next available name which is *A. divaricarpa* A. Nelson. Although Torrey & Gray considered the plant a distinct species,[2] Gray himself later considered it to be a mere variety of his *A. Drummondi*,[3] and Watson, transferring *A. Drummondi* to *A. confinis*, according to his description and citation

[1] Ruprecht, Fl. Cauc. 73 (1869).
[2] T. & G., l. c.
[3] Gray, Man. ed. 5: 69 (1867).

of specimens, included the Torrey & Gray plant in it.[1] Two years hence, however, he and Coulter segregated var. *brachycarpa* from typical *A. confinis*,[2] but it was not until 1894 when Britton made the combination *A. brachycarpa*,[3] based on the Torrey & Gray plant, that it was again given specific rank. Fernald, studying the "*confinis-brachycarpa-Drummondi*" group in 1903, clearly elucidated the fact that *A. brachycarpa* was quite separate from *A. Drummondi*, and that Watson had used the name *A. confinis* to include both plants.[4] Fernald also included Nelson's *A. divaricarpa* as a synonym for our plant, but the homonym rule was not in existence at that time, so he was in no way obligated to discard the name *brachycarpa* in favor of *divaricarpa*.

Graham's description of *Turritis patula*[5] so exactly fitted this plant that I asked Mr. C. A. Weatherby if he would be kind enough to compare it with the Graham type at the Royal Botanic Garden at Edinburgh. Furthermore, the fact that one very old sheet of this species in the Gray Herbarium was labelled "*T. patula* Graham" (*Bourgeau*, collected in Saskatchewan in 1858) suggested the possibility that that name might actually be the correct one for the plant. But Mr. Weatherby, returning from Europe in November 1935, sadly informed me that no specimen had been preserved at Edinburgh by Graham. Gray misunderstood the Graham plant, incorrectly determining *Fendler's* no. 27 as *Turritis patula*,[6] which specimen has since been included in *A. Fendleri* (Watson) Greene; and Torrey, following Gray, but going one step further, made the combination *Arabis patula*.[7] Nevertheless, in the absence of any type specimen[8] and in view of the probability of Graham's plant being any one of several Rocky Mountain species, I am discarding Graham's name entirely, even as a synonym, until I am more certain just what plant he described.

In habit *A. divaricarpa* varies considerably. It may be robust, with

[1] Wats. in Proc. Am. Acad. xxii. 466 (1887).
[2] Watson & Coulter, l. c.
[3] Britton in Mem. Torr. Bot. Club, v. 174 (1894).
[4] Fernald, l. c.
[5] Graham in Edin. New Phil. Journ. 350 (July–Oct. 1829).
[6] Gray, Pl. Fendlerianae in Mem. Am. Acad. ser. 2. iv. 7 (1849).
[7] Torrey, Bot. Mex. Bound. Surv. ii. 33 (1859).
[8] Although Mr. Weatherby very kindly compared two sheets labelled *T. patula* from the Arnott Herbarium and assured me that they matched our plant in every particular, he emphasized the fact that they were merely determinations made by contemporaries of Graham, and should in no way be construed as Graham's conception of the plant.

a weedy appearance (growing in an alluvial or a sandy habitat), or rather delicate, having a fragile appearance (in which case it would most likely be found growing in limestone rock-crevices or talus slopes). The position of its fruiting pedicels and siliques also varies to a great extent, the former being ascending, divaricately spreading or even slightly deflexed, while the latter usually are suberect when young, but as maturity approaches invariably become widespreading and somewhat deflexed. The pods may be either straight or somewhat arcuate and their apices may vary from slightly obtuse to subacuminate. The length of the siliques also shows considerable variance, ranging from 3 to 9 cm. (a very few specimens possess siliques as small as 2 cm. long) and, although every effort has been made to segregate the plants into two series, those possessing short siliques (3–4.5 cm. long) and those possessing longer ones (4.5–9 cm. long) the efforts were finally abandoned. The name "*brachycarpa*" itself instantly suggests plants belonging to the first series and the type specimen of *T. brachycarpa* in the Herbarium of the New York Botanical Garden is actually one of these. But when we find specimens possessing both long and short siliques on the same plant the futility of separating them is obvious. The explanation of this fact, that some plants possess both short and long fruits, seems to be, that, after the original fruit of the main raceme has matured and the seeds are ready to be disseminated, several secondary branches arise from the axils of the leaves on the main stem and quickly bear flowers and fruits. The fruit of these secondary racemes is almost invariably of the short series. Hence the occurrence of plants with mature or overmature fruits of the long-fruited series bearing short fruits on secondary racemes is quite common. There are, of course, a few plants which possess short siliques entirely, but I am unable satisfactorily to segregate these.

The sepals are more often essentially glabrous, but not infrequently possess a few scattered minute hairs similar to those of the basal leaves. The seeds are, when young, very distinctly in two rows in the pod but at maturity one row seems to develop at the expense of the other so that a ripe pod contains, very commonly, only one row of seeds. When two rows occur in such a pod one of them is dwarfed and very irregular in outline. The pubescence of the basal leaves, although always of a stellate type, varies in quantity, some leaves being nearly glabrous, with only a few scattered hairs. Those of the first year, however, are always more stellate-pubescent than those of the

second year, and I have seen some specimens displaying tufts of 2nd year basal leaves which were quite glabrous, although the old leaves of the first year's growth were decidedly stellate-pubescent.

Geographically, *A. divaricarpa* is found in the Rocky Mountains of the United States and Canada, throughout British Columbia and Alberta to the Yukon Territory and the Mackenzie River, extending eastward over the Great Plains through the Great Lakes region to northwestern New England and southern Quebec around the region of the St. Lawrence River, eastward to the tip of the Gaspé Peninsula. It is found in limestone habitats, chiefly in rocky crevices or on talus slopes, but it also grows abundantly on sandy beaches and in various alluvial habitats.

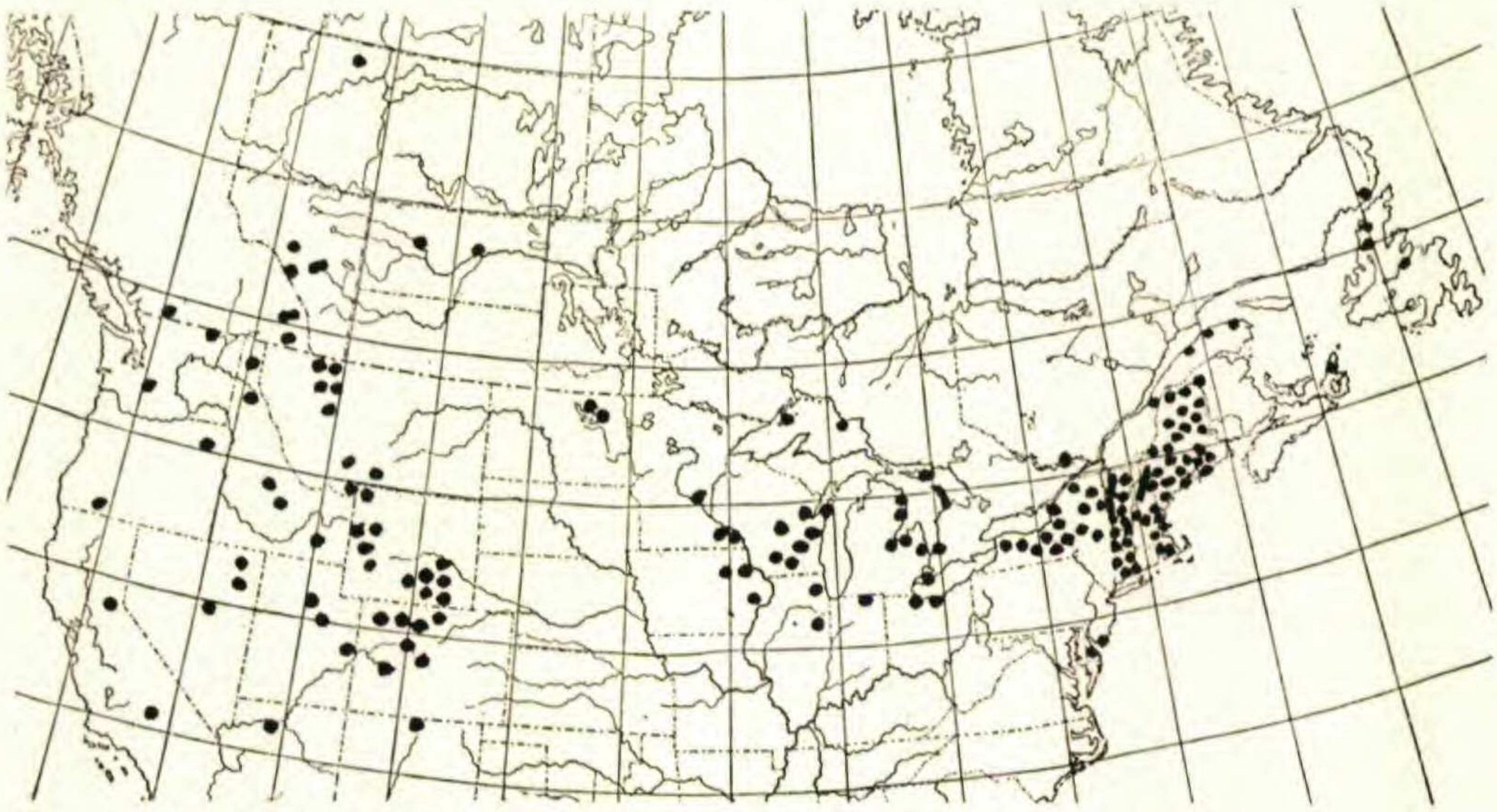
Var. *stenocarpa* has very narrow siliques (0.75–1.25 mm. broad), whereas the typical form of the species has them broader (1.25–2.35 mm.). Except for the station at Bic, Quebec, where both forms of the plant grow in close proximity, the only other locality for var. *stenocarpa* which I have been able to discover is at Prince Albert, Saskatchewan.

11. A. Drummondi Gray. Biennial, becoming perennial in western part of its range, somewhat weedy in appearance: stem erect, 2–9 dm. high, simple or branching at base and above, glabrous throughout to somewhat glaucous or very rarely scantily appressed-pubescent at extreme base: radical leaves spatulate to oblanceolate, in a basal crown, 3–9 cm. long, 5–20 mm. broad, dentate to serrate or subentire, acute to subacuminate, tapering at base to a slender winged petiole, glabrous throughout or rarely sparingly ciliate on the petioles with mostly simple or rarely two-forked hairs; cauline leaves linear-lanceolate to lanceolate-oblong, imbricate to subremote, 2–9 cm. long, 4–15 mm. broad, sessile with a sagittate or very rarely auriculate base, acute to subacuminate, sparingly dentate to entire, glabrous on both surfaces: flowers in loose racemes; flowering pedicels glabrous, erect, 7–10 mm. long at anthesis; sepals linear-oblong, ½ as long as petals, 3–4 mm. long, glabrous, acute to subacute, herbaceous; petals pink to purple (often white when dried), 5–10 mm. long, 0.5–2 mm. broad at apex: siliques straight or very rarely slightly curved, normally flattish, erect or ascending, often subappressed, 4–10 cm. long, 1.5–2.3 mm. broad, obtuse or rarely subacute, glabrous, one-nerved at least beyond the middle and frequently to the top; fruiting pedicels strictly erect, appressed to subappressed, glabrous, 9–15 mm. long at maturity; stigma flattish, on a short style not exceeding 1 mm. long, or rarely sessile to subsessile; seeds in two rows, broadly elliptical to orbicular, averaging 1 mm. in diameter, winged narrowly all around.—A very variable species, represented by six geographical varieties:

*a.* Siliques 1.5–2.3 mm. broad....*b.*
*b.* Plants tall, not alpine (except rarely var. *oxyphylla*), 2.5–9 dm. high....*c.*
*c.* Basal leaves and base of stem quite glabrous or only very rarely subciliate along the margins with simple hairs....var. *typica.*
*c.* Basal leaves and base of stem pubescent in some form, either stellate or pseudostrigose....*d.*
*d.* Basal leaves and base of stem stellate-pubescent with tri-furcate hairs, never appearing strigose or strigillose.....var. *pratincola.*
*d.* Basal leaves and stem appearing strigose or strigillose due to a very appressed pubescence of bi-furcate (malpighiaceous) hairs.....var. *oxyphylla.*
*b.* Plants alpine, dwarf, subcaespitose, 1–2 dm. high....*e.*
*e.* Basal leaves and base of stem stellate-pubescent with bi- and tri-furcate hairs.....var. *oreophila.*
*e.* Basal leaves and base of stem glabrous or only sparingly ciliate along the margins with simple hairs.....var. *alpina.*
*a.* Siliques 2.4–3.3 mm. broad.....var. *connexa.*

Var. **typica.** *A. Drummondi* Gray in Proc. Am. Acad. vi. 187 (1866) and Manual, ed. 5: 69 (1869); Porter & Coulter, Fl. Colo. 6 (1874); Watson in Gray, Syn. Fl. N. Am. i. 166 (1895) in part; Britton & Brown, Ill. Fl. ii. 150 (1897) in part; Fernald in RHODORA, v. 230 (1903); Robinson & Fernald in Gray, Man. ed. 7: 437 (1908); Coulter & Nelson, Man. Rocky Mt. Bot. ed. 2: 226 (1909); Rydberg, Fl. Rocky Mts. 359 (1917) and Fl. Pr. & Pl. 381 (1932); Smiley, Fl. Sierra Nevada, 206 (1921). *Arabis laevigata* Hooker, Fl. Bor.-Am. i. 43 (1829), non Poiret. *Turritis stricta* Graham in Edinburgh New Phil. Jour. 350 (1829); Hooker, l. c. 40; T. & G. Fl. N. Am. i. 79 (1838); Walpers, Rep. i. 129 (1843); Dietrich, Synop. iii. 688 (1843); Torrey, Fl. N. Y. i. 53 (1843); Gray, Man. 36 (1848); Gray, Ill. Gen. i. 144. t. 59 (1848); Wood, Classbk. 229 ed. of 1861, non *Arabis stricta* Hudson. *Streptanthus angustifolius* Nutt. ex T. & G. l. c. 76, non *A. angustifolia* Lam. Dict. i. 220 (1789). *Turritis glabra* L. var. β T. & G. l. c. 78. *Arabis confinis* Wats. in Proc. Am. Acad. xxii. 466 (1887); Watson in Gray, Synop. Fl. N. Am. i. 163 (1895) in part; Rydberg, Fl. Pr. & Pl. 380 (1832). *Arabis brachycarpa* Britton in Mem. Torr. Bot. Club, v. 174 (1894) in part. *Turritis Drummondi* Lunell in Am. Mid. Natl. v. 236 (1918).—Southern Labrador, Newfoundland and adjacent Quebec, south to southern New Jersey and northern Delaware, west to interior California, Washington, Oregon and British Columbia. The following are characteristic. LABRADOR: limestone and calcareous terraces, Blanc Sablon, *Fernald & Wiegand*, no. 3,493; limestone terraces, Blanc Sablon, *Griscom*, no. 2; stream-bank west of Blanc Sablon River, *Abbe*, no. 1,205. NEWFOUNDLAND: meadow below limestone escarpment, western face of Bard Harbor Hill, *Fernald & Long*, no. 28,422; turfy slopes below limestone crest, Killdevil, *Fernald, Long & Fogg*, no. 1,756; ledges and talus, north bank of Exploits River below the falls, Grand Falls, *Fernald & Wiegand*, no. 5,498. QUEBEC: schistose talus and wet shelves at base of Big Chim-

ney, Mt. Mattaouisse, *Dodge, Griscom & Pease*, no. 25,806; dry schistose crests and talus of Razorback Ridge, Mt. Logan, *Pease & Smith*, no. 25,807; slaty ridges east of the village, Bic, Rimouski Co., *Fernald & Collins*, nos. 1,062 and 1,063; beach below Middle Camp, Rivière Ste. Anne des Montes, *Fernald & Collins*, no. 572. New Brunswick: dry ledges, St. John River, Connors, Madawaska, *Pease*, no. 2,560. Nova Scotia: Margaree, Cape Breton Island, *Macoun*, no. 18,997 (as *A. laevigata*). Maine: shaded gravelly banks, St. Francis, *Fernald*, no. 13; banks of Androscoggin R., Canton, *Parlin*, no. 2,040; Gardiner, *Richards*, 12 May 1899. New Hampshire: rocky cliffs by railroad, Crawford Notch, *Greenman*, no. 1,107 (as *A. laevigata*); near Willey House, White Mt. Notch, *C. E. Faxon*, 7



Map 18. Range of Arabis Drummondi, var. typica.

June 1878; west base of Fall Mt., Walpole, *Fernald*, no. 102. Vermont: Round Mt., Shrewsbury, *Eggleston*, no. 1,025; rocky talus, Fairlee, *Pease*, no. 20,300 [Amh]; gravelly river bank, South Vernon, *Fernald & Floyd*, 11 May 1912. Massachusetts: river bank, Tewksbury, *C. H. Knowlton*, 9 May 1903 (as *A. laevigata*); valley in sand dunes, Plum Island, *Mulliken*, 16 Aug. 1916; Rocky Mt., Greenfield, *E. F. Williams*, 17 June 1910. Rhode Island: Woonsocket, *Pratt*, 1847 (as *Turritis stricta*, "*T. glabra*"); rocky ridge about 1 mi. north of Albion R. R. Sta., Cumberland, *Collins*, 26 May 1931; on rocky ridge, Snake Den, Johnston, *Collins*, 14 May 1933. Connecticut: wooded hammock at mouth of Connecticut R., Old Lyme, *Graves*, no. 121; shaded sandstone ledges, East Granby, *Weatherby*, no. 4,442. New York: moist rocks, Canton, *O. P. Phelps*, no. 528; Lewiston, *G. W. Clinton*, 1864 (as *T. stricta*); rocky wooded banks, Black River, Watertown, *H. D. House*, no. 8,940; on dry bank, ravine beyond McKinney's Glens, Lansing, *Wiegand*, no. 2,412. New Jersey: white sand among cedars and beach plum, near Bay Shore, Cape May

Point, *W. Stone*, 10 May 1924 (as *A. glabra*); sand hills, Cape May Point, *Mackenzie*, 20 June 1919 [NY]; dry open sandy thickets among dunes, Cape May Point, *Long*, no. 21,517 [Phil]. DELAWARE: field near Concord Station, Wilmington, *Commons*, June 1897. ONTARIO: Cove Island, Tobermory, Bruce Peninsula, *Krotkov*, no. 7,464 (as *A. hirsuta*); dry limestone boulders on shore of Georgian Bay, north of Dyer's Bay, *Stebbins & Loveless*, no. 132; sandy woods north of Oscoda, *Fernald & Pease*, no. 3,330; Pelee Point, Lake Erie, *Macoun*, no. 33,778 (as *A. laevigata*). MICHIGAN: at foot of high ridge near Harrisville, Alcona Co., *C. K. Dodge*, no. 11; Isle Royale, *Cooper*, 4 July 1909; Saginaw Bay, *C. K. Dodge*, nos. 240, 241, 242, 243 [US]. OHIO: Cedar Point, Erie Co., *Moseley*, 15 May 1893 and 24 May 1894; Green Island, Ottawa Co., *Moseley*, 25 May 1895. WISCONSIN: dry sand, Wisconsin River bottoms, opposite Sauk City, Roxbury, *Fassett*, no. 3,528; White Fish Bay, *Gillman*, 1866 (as *T. stricta*); Eagle Cliff, Ephraim, Door Co., *Pease*, no. 18,036. ILLINOIS: large colony in rich open woods near Spoon River bridge, north part of St. Joseph, *Pease*, no. 17,751; Forest Glen, *E. T. Harper*, 4 June 1892 [Wisc]; Elgin, *Vasey*, without number or date. INDIANA: gravelly wooded bank of St. Joseph's River, 1½ mi. sw. of Bristol, Elkhart Co., *Deam*, no. 33,755 [Deam]. MINNESOTA: Lake City, *Manning*, 25 June 1883 [Minn]; dry sandy flat, Rochester, *Ainslee*, no. 1,780 [Minn]; St. Cloud, Stearns Co., *Campbell*, no. 141 [Minn]. IOWA: Iowa City, *A. S. Hitchcock*, without date [Mo]; Fayette Co., *B. Fink*, June 1894 (as *A. laevigata*); Charles City, *J. C. Arthur*, 20 June 1874 [Wisc]; Johnson Co., *Fitzpatrick & Fitzpatrick*, 5 May 1895 [Mo]. NORTH DAKOTA: rocky open ground near Devil's Lake, Ramsey Co., *E. J. Palmer*, no. 36,882; in thickets, Devil's Lake, *J. Lunell*, 29 June 1902. SASKATCHEWAN: base of Mt. Wilson, north fork of north branch of Saskatchewan River, *S. Brown*, no. 999. ALBERTA: Pine Lake District, Wood Buffalo Park, *Raup*, no. 2,488; mountainside, Lake of the Clouds, Laggan, *M. A. Barber*, no. 129; Maligne Lake, *S. Brown*, no. 1,257; Mt. Molar Creek, *Macoun*, no. 64,505. MONTANA: Spanish Basin, Madison Range, *Flodman*, no. 501 [NY]; along Swiftcurrent Creek below Lake McDermott, Glacier National Park, *Standley*, no. 15,514 [US]; West Gallatin River, *Lamson-Schribner*, no. 8h in part (as *A. perfoliata*). IDAHO: Bear Valley, *J. H. Christ*, no. 1,809A [US]; moist creek-bank, Salmon River Mts., near Bonanza, *Macbride & Payson*, no. 3,426; Indian Creek Canyon, vicinity of Pocatello, *Mrs. M. E. Soth*, nos. 189 & 566 [NY]. WYOMING: dry timbered slopes, Centennial, *A. Nelson*, no. 8,736 (as *A. connexa*); dry soil, Teton Pass, *Merrill & Wilcox;* no. 930; Jackson's Hole, Lincoln Co., *Payson & Payson*, no. 2,215; dry hillsides, Bridger Peak, Carbon Co., *Goodding*, no. 1,963 (as *A. connexa*). COLORADO: in open fallen timber, Camp Creek, Larimer Co., *Goodding*, no. 1,461 (as *A. oxyphylla*); Carson, region of the Gunnison R. Watershed, *C. F. Baker*, no. 308 (as *A. oxyphylla forma* ?) [NY]; Breckenridge, *C. L.*

*Shear*, no. 4,560 (as *A. philonipha*) [NY]. Utah: Big Cottonwood Canyon, Salt Lake Co., *Garrett*, 12 July and 3 Aug. 1905; rock slide, La Sal Mts., Grand Co., *Payson & Payson*, no. 3,945; Alta, Wahsatch Mts., *M. E. Jones*, no. 1,177. Nevada: ridge on north side of Lamouille Canyon, Elko Co., E. Humboldt Mts., *Heller*, no. 9,372 (as *A. philonipha*) [NY]; among rocks, Pine Mt., vicinity of Gold Creek, *A. E. Hitchcock*, no. 1,173 [US]. Arizona: north rim, Grand Canyon, *Eastwood & Howell*, no. 967. New Mexico: grassy slopes, Costilla Park, Jaos Co., *Mrs. O. S. J.*, no. 58. California: Donner Pass, in granite, *Heller*, no. 13,319; Death Valley, near Mineral King, Tulare Co., *Coville & Funston*, no. 1,450. Oregon: Powder River Mts., *Piper*, no. 2,507; Ashland Butte, Siskiyou Mts., *Cusick*, no. 2,970 (in part, the other specimen on the sheet being var. *pratincola*) [Minn]. Washington: rocky talus slope in Angels Pass, Okanogan Co., *J. W. Thompson*, no. 7,044; in rocky ground, Mt. Rainier, *Piper*, no. 2,065; north of Mt. Henderson, *Henderson*, no. 2,396. British Columbia: Cornwall Hills, *McEvoy*, no. 5,097 (as *Arabis confinis*); Avalanche Path, Emerald Lake, *H. Peterson*, no. 52; rocky slopes, Chilliwack Lake, *J. M. Macoun*, no. 33,790 [Can]; crevices of rocks, Toad Mt., Kootenay Lake, *J. M. Macoun*, no. 1,740 [Can]. *Fl.* May to July; *fr.* May to August. Map 18.

Var. alpina Watson. Perennial, low, 1–2 dm. high; caudex multicipital; plant often caespitose: basal leaves glabrous or slightly ciliate on petioles; petioles glabrous or often ciliate to subciliate with both simple and bifurcate hairs.—Watson in Bot. King's Exp. (40th Parallel), v. 18 (1871) in part; Porter & Coulter, Synopsis Fl. Colorado, 6 (1874). *A. Lyallii* Watson in Proc. Am. Acad. xi. 122 (1876) in part; Brewer & Watson, Bot. Calif. i. 32 (1876); Coulter, Man. Rocky Mt. Bot. 20 (1885); Watson in Gray, Synop. Fl. N. Am. i. 166 (1895); Howell, Fl. Nw. Am. i. 44 (1897); Piper, Fl. Wash. 295 (1906); Frye & Rigg, Nw. Fl. 189 (1912); Rydberg, Fl. Rocky Mts., 359 (1917); Tidestrom, Fl. Utah & Nevada, 244 (1925); all in part. *A. Albertina* Greene in Pittonia, iv. 196 (1900); Rydberg, Fl. Rocky Mts., 359 (1917).—Alpine habitats above 5,000 ft. altitude, Alberta and British Columbia, south to Colorado, Utah, Nevada and California. The following are characteristic. Alberta: Mt. Temple, Laggan, *Butters, Holway & Rosendahl*, no. a7; alpine slopes, alt. 6,500 ft., Moose Mt., Elbow R., *Macoun*, no. 18,101 (type of *A. Albertina*) [Can]; Lake O'Hara, alt. 7,500 ft., *Macoun*, no. 64,509 (as *A. Albertina*). Montana: McDonald's Peak, Mission Range, alt. 7,500 ft., *Canby*, no. 19; McDougal Peak, vicinity of Flathead Lake, *Mrs. J. Clemens*, 31 July 1908; Old Hollowtop, near Pony, alt. 9,000 ft., *Rydberg & Bessey*, nos. 4,215 & 4,216 (as *A. columbiana*) [NY]. Idaho: ridge south from Wiessner's Peak, Coeur d'Alene Mts., alt. 2,100 m., *Leiberg*, no. 1,362; slide rock on peak, alt. 9,000 ft., Josephus Lakes, Custer Co., *Macbride & Payson*, no. 3,552 (in part); divide between St. Joe and Clearwater River, alt. 1,900 m., *Leiberg*, no. 1260;

Rocky Mts. at 7,000 ft., *Dr. Lyall*, 1861 (as *T. stricta;* type of *A. Lyallii*). WYOMING: Dunraven Peak, *Nelson & Nelson*, no. 6,698 [NY]; upper fork to head of Du Noir R., *C. C. Curtis*, 15 Aug. & 3 Sept. 1899 [NY]; crevices of rocks, Teton Mts., Jackson's Hole, *Merrill & Wilcox*, no. 1,253 [US]; Red Mt., ne. of Smoot, Lincoln Co., *Payson & Armstrong*, no. 3,638 [Mo].

COLORADO: Berthoud Pass, *L. Johnson*, no. 984 [Mo]; rocks about Berthoud, *Engelmann*, 2 Sept. 1874 [Mo]. UTAH: moist slopes below snow banks, La Motte Peak, Uintah Mts., elev. 10,500 ft., *Payson & Payson*, no. 5,043; Alta, Wahsatch Mts., alt. 11,000 ft., *M. E. Jones*, no. 1,248; Mt. Barette, *Rydberg & Bessey*, no. 7,326 [NY]. NEVADA: Clover Mts., alt. 10,000 ft., *S. Watson*, no. 75 (in part) (TYPE in Gray Herbarium). CALIFORNIA: Tamarack Trail, Tahoe, alt. 8,200 ft., *Smiley*, no. 271; on granite rocks below Donner Pass, Nevada Co., *Heller*, no. 7,121; Pyramid Peak, east side just below the summit, alt. 9,900 ft., *Smiley*, no. 118. OREGON: Cascade Mts., *Dr. Lyall*, 1860 (as *T. stricta*); cliffs of Blue Mts., head of Anthony's Creek, alt. 7,000 ft., *Cusick*, no. 2,245; Eagle Creek Mts., alt. 6,000 ft., *Cusick*, no. 1,053; summit of Paulina Peak, *M. E. Peck*, no. 9,672. WASHINGTON: Mt. Rainier, alt. 7,000 ft., *E. C. Smith*, no. 801; Mt. Adams, *T. Howell*, no. 557; loose soil among rocks, Mt. Paddo, alt. 7,000 ft., *Suksdorf*, no. 508; dry rocks of Columbia R., Klickitat Co., *Suksdorf*, 28 April 1881; high peaks, Olympic Mts., alt. 6,500 ft., *Piper*, no. 2,180. BRITISH COLUMBIA: Lake House, Skagit R., *J. M. Macoun*, no. 70,827 [Can]; among lichens on large boulder, alt. 5,600 ft., Cheam Range, no. of Chilliwack R., *J. M. Macoun*, no. 33,787 [Can.]; slopes between Mt. Field and Mt. Wapta, *M. V. Walcott*, 1919 [US]. MAP 19.

MAP 19. Range of ARABIS DRUMMONDI, var. ALPINA.

Var. **oreophila** (Rydberg), comb. nov. Perennial or more rarely biennial, low, rarely 1–2 dm. high; stem glabrous or more rarely faintly stellate-pubescent at the extreme base; basal leaves loosely stellate-pubescent on both surfaces with 2–3-forked hairs.—*A. oreophila* Rydberg in Bull. Torr. Bot. Club, xxxiv. 437 (1907); Rydberg, Fl. Rocky Mts. 359 (1917). *A. Lyallii* Watson in Proc. Am. Acad. xi. 122 (1876) in part.—Alberta to Washington, along the mountains to Colorado. The following are characteristic. ALBERTA: head of Ptarmigan Valley, *S. Brown*, no. 385; Brazeau, opposite Cataract Pass, *S. Brown*, no. 1,044 [Phil]; on "The Saddle," Lake Louise, *Macoun*, no. 64,510. MONTANA: MacDougal's Peak, nw. Montana, *D. T. MacDougal*, no. 606 [NY]; mountain sides, Midvale, *Umbach*,

Map 20. Range of Arabis Drummondi, var. oreophila.

no. 577 [NY]. Idaho: alpine slopes, Henry Lake, Fremont Co., *Payson & Payson*, no. 1,984 [NY]; mts. of central Idaho, *L. F. Henderson*, no. 13,932 [Phil]. Wyoming: mountains near Cottonwood Lake, east of Smoot, Lincoln Co., alt. 9,500 ft., *Payson & Armstrong*, no. 3,788; Union Peak, *A. Nelson*, no. 1,007 [NY]. Utah: Big Cottonwood Canyon, Salt Lake Co., *Garrett*, 28 June 1905; Alta, Wahsatch Mts., *M. E. Jones*, no. 1,248; divide between Big Cottonwood Canyon and Heber Valley, *Rydberg & Carlton*, no. 6,678 (type in Herbarium of N. Y. Botanical Garden). Nevada: Clover Mts., near Deeth, *Heller*, no. 10,231 [US]. Oregon: Eastern Oregon, *T. J. Howell*, no. 245 [US]. Washington: Sheep Mt., Okanogan Forest, Okanogan Co., *Eggleston*, no. 13,314 [US]; rocky ravines, Mt. Rainier, *J. B. Flett*, 29 August 1896 [US]. British Columbia: gravel at 7,000 ft. level, Burgess Pass, Emerald Lake, *Pease*, no. 22,358 [Amh]. Map 20.

Var. **pratincola** (Greene), comb. nov. Base of stem and radical leaves minutely stellate-pubescent, otherwise similar to var. *typica*.—*A. pratincola* Greene in Fedde, Rep. Spec. Nov. v. 244 (1908).—Alberta and British Columbia south to New Mexico and California. The following are characteristic. Alberta: Laggan, *Macoun*, no. 64,518; Porcupine Hills, *W. D. Cram*, 15 June 1920 [Can]. Montana: Bozeman, Gallatin Co., *E. J. Moore*, 19 May 1900; Middle Creek, *Blankinship*, 6 June 1900 [NY]; Middle Creek, near Bozeman, *Blankinship*, no. 30 [US]; open hillsides, vicinity Glacier Park Station, *Standley*, no. 15,014 [US]; hills, Midvale, *Umbach*, no. 62 [Wisc]. Idaho: alpine slopes, Henry Lake, Fremont Co., *Payson & Payson*, no. 1,984. Wyoming: sand bars in creek, Horse Creek, 7 mi. w. of Merna, Sublette Co., *Payson & Payson*, no. 2,739 [US]. Colorado: near Estes Park, *G. E. Osterhout*, June 1894 [Minn]. Nevada: Spooner, Douglas Co., *Baker*, no. 1,149 (type of *A. pratincola*). New Mexico: gulch of small stream on road to Park View, Tierra Amarilla, Rio Arriba Co., *Eggleston*, no. 6,481 (as *A. oxyphylla*) [NY]. California: Mono Pass, *Bolander*, 1866; Half Moon Lake, region of Lake Tahoe, *E. A. McGregor*, no. 66 [US]; Loy Lake, Siskiyou Co., *G. D. Butler*, no. 1,524 [US]; Twin Valley near Truckee, Nevada Co., *C. F. Sonne*, no. 17 [Phil]. Oregon: Ashland Butte, *Cusick*, no. 2,970 (in

Map 21. Range of Arabis Drummondi, var. pratincola.

part, the other specimen on the sheet being var. *typica*); sandy ground, summit of Horse Pasture Mt., 10 mi. s. of McKenzie Bridge, Lane Co., *M. E. Peck*, no. 2,708; sandy slope, Siskiyou Mts., 4 mi. se. of Oregon Caves, Josephine Co., *Peck*, no. 8,276; moist slopes of Strawberry Mt., Blue Mts., Grant Co., *L. F. Henderson*, no. 5,579. WASHINGTON: rocky open slopes, Mt. Angeles, Clallam Co., *J. W. Thompson*, no. 7,427; alpine rocky slopes in Chinook Pass, Yakima Co., *J. W. Thompson*, no. 9,844 [NY]. BRITISH COLUMBIA: northern British Columbia, *J. T. Rothrock*, no. 30 [US]; Old Glory Mt., between Kettle & Columbia Rivers, *Macoun*, no. 63,495a [US]. MAP 21.

Var. **oxyphylla** (Greene), comb. nov. Basal leaves closely appressed-pubescent with bifurcate (malpighiaceous) hairs, appearing strigose or strigillose.—*A. oxyphylla* Greene in Pittonia, iv. 196 (1900). *A. philonipha* Nelson ex Rydberg, Fl. Colorado, 165 (1906).[1]—High altitudes from northern British Columbia to the Black Hills, South Dakota, New Mexico and California. SOUTH DAKOTA: rim of Spearfish Canyon, near Savoy, *J. Murdoch, Jr.*, no. 4,117. SASKATCHEWAN: Cypress Hills, *Macoun*, nos. 1,744, 3,071 and 10,407 [Can]. ALBERTA: Squaw Mt., Banff, *Miss A. Pelluet*, no. 91,116 [Can]; Sheep Mt., Waterton Lake, *Macoun*, no. 10,408; summit, Tunnel Mt., *Macoun*, no. 1,667 [Can]; alpine slopes, Rocky Mts., *Macoun*, no. 100,729 [Can]. MONTANA: Cedar Mt., alt. 10,000 ft., *Rydberg & Bessey*, no. 4,217 (as *A. philonipha*) [NY]; Spanish Peak, Madison Range, *Flodman*, no. 500; Bridger Mts., *Rydberg & Bessey*, no. 4,209. IDAHO: dry gravelly woods above Yalma, *L. F. Henderson*, no. 3,536 [US]; divide between St. Joe and Clearwater Rivers, *Leiberg*, no. 1,212; ridges south from Wiesner's Peak, *Leiberg*, no. 1,374. WYOMING: dry soil, Leckie, *Merrill & Wilcox*, no. 549; Teton Mts., near Leigh's Lake, *Merrill & Wilcox*, no. 1,052; Surveyor Park, Sublette Co., *Payson & Payson*, no. 2,850; on moist slopes below snowbanks, Telephone Mines, Albany Co., *A. Nelson*, no. 7,913 (type of *A. philonipha*). COLO-

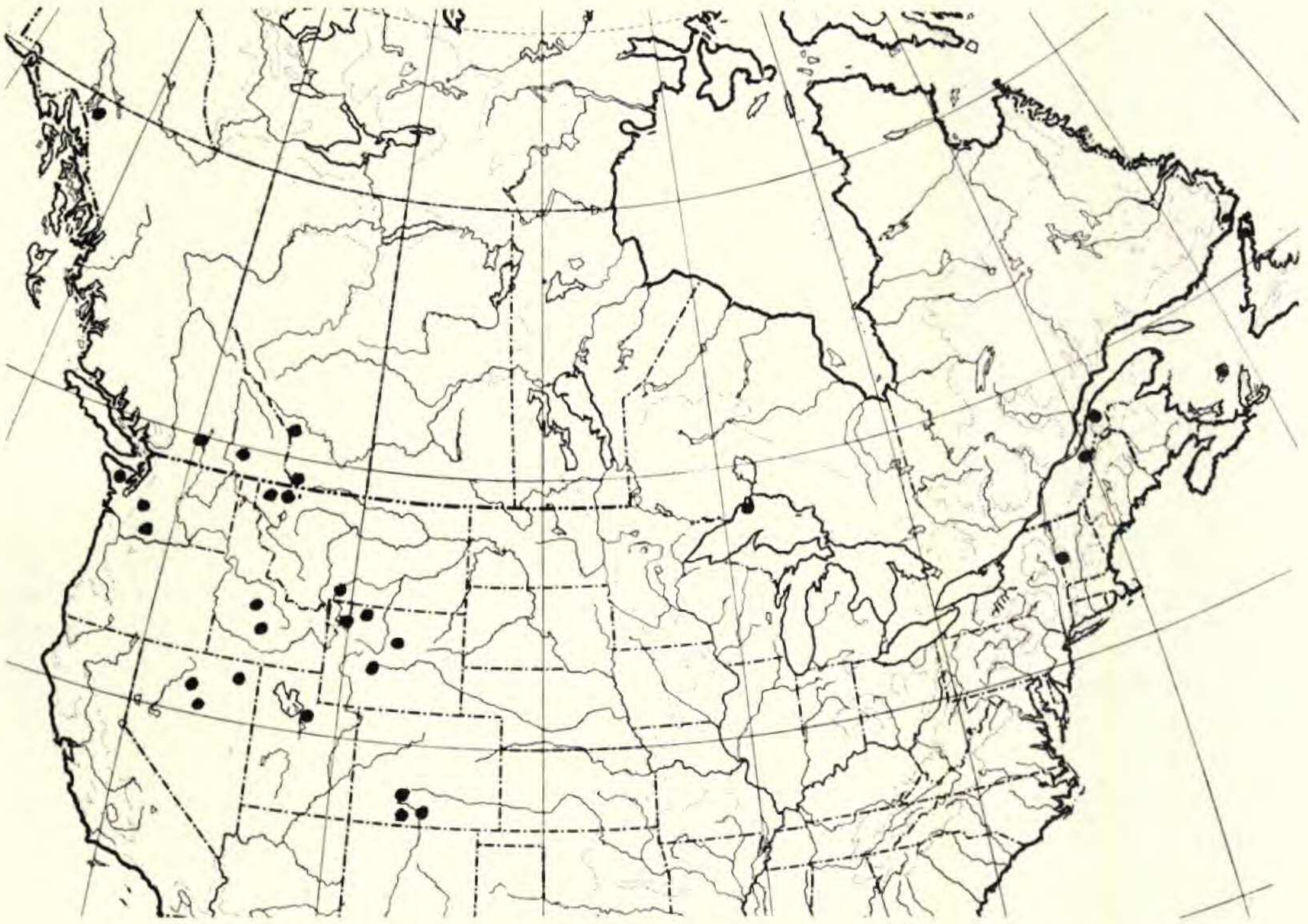
MAP 22. Range of ARABIS DRUMMONDI, var. OXYPHYLLA.

[1] See letter of Feb. 1, 1909, P. A. Rydberg to Miss Mary A. Day, Librarian of the Gray Herbarium of Harvard University, preserved in Historic Letter Files of that institution. Rydberg says, in discussing errors in his Flora of Colorado: "page 165. *Arabis philonipha* A. Nels. should be *Arabis Drummondii* A. Gray. Prof. Nelson had distributed the plant under a manuscript name. Long time ago I discovered its identity with *A. Drummondii* and corrected it in my mss. for my unpublished Rocky Mountain flora. I do not know how it happened that the correction was not made in that for the Flora of Colorado also."

RADO: grassy places among willows, Beaver Creek, Larimer Co., *Goodding*, no. 1,446; Gunnison R. Watershed, Carro Summit, *Baker*, no. 48 [Mo]; Dark Canyon, *Clements & Clements*, no. 176; near Pagosa Peak, *C. F. Baker*, no. 747 (ISOTYPE in Herbarium of Pomona College). Chicken Creek, W. La Plata Mts., *Baker, Earle & Tracy*, no. 128. UTAH: Wahsatch Mts., *S. Watson*, no. 74 in part; slope of mountain near Delano Peak, Tushar Range, *Hodgdon & Rossbach*, no. 71; common in open pine forest, Stillwater Fork, Uintah Mts., *Payson & Payson*, no. 4,980; open flats, Young's Springs, Uintah Mt., *Goodding*, no. 1,197. NEVADA: East Humboldt Mts., *S. Watson*, no. 75 (in part; in Gray Herbarium, but not the plant in the U. S. National Herbarium which is *A. Drummondi* var. *alpina*); on slopes, Bunker Hill Mt., *Tidestrom*, no. 10,928 [US]; dry open woods, 7 mi. e. of Ely, *A. E. Hitchcock*, no. 1,307 [US]. NEW MEXICO: Grass Mt., Pecos River National Forest, alt. 10,000 ft., *Standley*, no. 4,069; Navajo Indian Reservation in Tunitcha Mts., *Standley*, no. 7,539 [US]; vicinity of Ute Park, Colfax Co., *Standley*, no. 14,152 [NY]. CALIFORNIA: Mono Pass, Tuolumne River, *Brewer*, no. 1,729. WASHINGTON: near summit of Mt. Hermann, 5,500 ft., region of Mt. Baker, *J. W. Thompson*, nos. 5,742 and 5,323; rocky draw near stream, Mt. Angeles, Olympic Mts., *Thompson*, nos. 7,427 and 7,544. BRITISH COLUMBIA: west and northwest slopes of Mt. Selwyn, alt. 5,000 ft., about 56° 1′ N., 123° 39′ W., *Raup & Abbe*, no. 4,081; Cheam Range, north of Chilliwack River, *J. M. Macoun*, no. 33,489 [Can]. MAP 22.

Var. CONNEXA (Greene) Fernald. Siliques 2.4–3.3 mm. broad, otherwise as in var. *typica*.—RHODORA v. 231 (1903); Smiley, Bor. Fl. Sierra Nevada in Calif. 206 (1921). *A. connexa* Greene in Pittonia, iv. 197 (1900); Rydberg, Fl. Colo. 165 (1906).—Southern Labrador, Newfoundland and Quebec, northern New England, Michigan, Rocky Mountains west to Washington and British Columbia. The following are characteristic. LABRADOR: limestone and calcareous sandstone terraces, Blanc Sablon, Straits of Belle Isle, *Fernald & Wiegand*, no. 3,493. NEWFOUNDLAND: dryish limestone talus, western face of Doctor Hill, *Fernald & Long*, no. 28,420; mossy and turfy trap cliffs and talus, Anse aux Sauvages, *Fernald, Wiegand & Long*, no. 28,421. QUEBEC: dry ledges, Rivière du Loup, Temiscouata Co., *Fernald & Collins*, 12 & 13 July, 1904; Rivière du Loup, *Fernald & Williams*, 2 Aug. 1902; Natashquan, sur les dunes, rare, une seule colonie, *Victorin & Rolland*, no. 28,571; sur le sable sec, Ile de Havre-aux-Maisons, Magdalen Islands, *Victorin & Rolland*, no. 9,583. VERMONT: on ledges, Birch Hill, Brandon, *D. L. Dutton*. MICHIGAN: rock crevices, Rock Harbor, Isle Royale, *C. S. Williamson*, no. 2,303 [Phil]. ALBERTA: mountain slopes, Silver City, *Macoun*, 7 Aug. 1885 [Can]; prairies, foothills of Rocky Mts., Waterton Lake, *Macoun*, no. A1002. MONTANA: gravelly roadside, Hudson Bay Divide, about 13 mi. w. of Browning, *Hodgdon & Rossbach*, no. 70; open slope, vicinity of Cracker Lake, Glacier National Park, *Standley*, no. 15,865 [US];

East De Lacy's Creek, Yellowstone Park, *Rydberg & Bessey*, no. 4,210. IDAHO: along creek, above Redfish Lake, Custer Co., *Payson & Macbride*, no. 3,659; Wood River, 5 mi. above Ketcham, *L. F. Henderson*, no. 3,241 [US]. WYOMING: parks, Big Horn Mts., *W. H. Forwood*, 5 Aug. 1881–82 [US]; Gardiner, Yellowstone Park, *P. H. Hawkins*, 7–12 Aug. 1922 [US]; Union Pass, *A. Nelson*, no. 875. COLORADO: Rocky Mts., *Hall & Harbour* No. 35; lower slopes of peak on divide between Silvertown and Ourey, San Juan Mts., *Hodgdon & Rossbach*, no. 69; near Pagosa Peak, *C. F. Baker*, no. 341 (ISOTYPE of



MAP 23. Range of ARABIS DRUMMONDI, var. CONNEXA.

*A. connexa*); Cumberland Basin, La Plata Mts., *Eastwood*, Aug. 1892. UTAH: without locality, *L. F. Ward*, 1875 [US]. NEVADA: ridge in north side of Lamoille Canyon, Elko Co., *Heller*, no. 9,370 [US]; dry hill, vicinity of Gold Creek, *A. E. Hitchcock*, no. 1,098 [US]; dry hill, Toiyabe Forest, Bunker Hill, *A. E. Hitchcock*, no. 8,691 [US]. WASHINGTON: base of cliffs on Church Mt., *J. W. Thompson*, no. 11,283 [NY]; dry ledges, Olympic Mts., *Piper*, no. 2181; Mt. Rainier, *Piper*, no. 206X; Mt. Angeles, *J. T. Howell*, no. 7,471; north of Mt. Adams, *L. F. Henderson*, no. 2,397. BRITISH COLUMBIA: near International Boundary between Kettle & Columbia Rivers, Mt. St. Thomas, *J. M. Macoun*, no. 63,499; Tami Hy Mt., Chilliwack Valley, *J. M. Macoun*, no. 33,788; Lake Atlin, *Eastwood*, no. 638. MAP 23.

The identity of typical *Arabis Drummondi* has been thoroughly discussed by Fernald,[1] and our conception of it has not materially changed in the thirty years since his paper appeared. Through the kindness of Mr. C. A. Weatherby, the type-specimen of *Turritis stricta* Graham, on which our species is based, has been examined, and he informs me that it complies in every character with the description given by Fernald.

In the flowering stage in the field it is very easy to confuse this species with *A. glabra* and with *A. divaricarpa* (*A. brachycarpa*). From them both it may be quickly distinguished by the almost glabrous stem and basal leaves, *A. glabra* having a hirsute pubescence in great abundance on basal leaves and lowermost stem, while *A. divaricarpa* has a stellate type of pubescence on these parts. From *A. glabra* the plant may be further differentiated by its pinkish to purplish flowers (rarely white), those of *A. glabra* always being yellowish to cream-color, and by the fact that it comes into full flower about two weeks earlier than *A. glabra*.

In the eastern part of its range it is almost wholly a biennial, and found in such habitats as rocky woods, dry ledges and cliffs, sandy or rocky river banks, open fields and open sand dunes (at Plum Island, Newbury, Mass.; white sand among cedars and beach plum, Bay Shore, Cape May Point, New Jersey). Here it flowers as early as the first week in May and continues until early June, by which time it is almost always in mature fruit. But in the Rocky Mountains and westward it tends to become a perennial, although still frequently maintaining the biennial habit, and flowers from one to two months later than in the East.

Var. *pratincola* is based on *A. pratincola* Greene, the type-specimen of which (Spooner, Douglas Co., Nevada, *Baker*, no. 1,149) has the erect and subappressed siliques so characteristic of var. *typica*, but with stellate-pubescent basal leaves and base of stem. From *A. divaricarpa* it differs at once in its strict and subappressed, longer siliques, but in flower the two are very similar and it is almost impossible to make a positive identification. This is one of the best examples of the similarity of species of *Arabis* in the flowering stage. In fruit, however, the two can be easily distinguished.

The type of *A. oxyphylla* Greene, on which I have based var. *oxyphylla*, is in the Herbarium of Notre Dame University. As it was

[1] Fernald in Rhodora v. 225 (1906).